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Forest Service

NORTHEASTERN FOREST EXPERIMENT STATION

In Cooperation with Yale University

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ANNUAL REPORT

of the

NORTHEASTERN FOREST EXPERIMENT STATION

COOPERATIVE RELATIONS AND FOREST POLICY

The past year has been characterized by a substantial increase in activities involving interrelations with other bureaus of the Department of Agriculture. Not only has the Forest Experiment Station been thrown into direct cooperation with other agencies in such activities as farm forestry and flood control surveys, but also one important result of the Department's state and county planning program has been to spotlight forestry as an important and integral part of agriculture in the Northeast. Those concerned with the broad problems of agriculture, both in the state colleges and the Department have come to realize as never before the importance of forest management to the welfare of agriculture in this region. The traveling seminar in July headed by Assistant Secretary M. L. Wilson showed forestry as the major enterprise offering promise of constructive use of land and labor being released in the process of agricultural adjustment. Mr. Wilson's enthusiastic response to the forest cooperative project at Cooperstown, N.Y. vindicates in large measure our position in inaugurating this particular approach to the problems of farm forestry.

State and County Planning

When the state agricultural planning committees were set up the Director of the Forest Experiment Station was designated as official representative of the Forest Service in Connecticut and Rhode Island. In Massachusetts, although an administrative officer was nominated by the Forest Service, the Station director was asked by the state chairman to serve on the committee also.

In New York, Mr. Lockard now serves as official Forest Service representative, in deference to the State Chairman who insisted that local men be designated by the Federal Agencies. Region 7, however, retains the privilege of attendance at all meetings.

While not strictly a research activity, participation by the Station in this State agricultural planning seems worth while. It keeps the research staff alert and posted on over-all developments in agricultural thinking. It should serve to sharpen the research approach in selection and handling of problems for investigation. Furthermore, work with these committees tends to maintain the prestige of the Station as a live organization, competent to participate in policy-forming affairs. There is reason for satisfaction in the confidence in the research staff which has been shown by State agencies in connection with representation on these committees. From a Service-wide point of view also, it seems desirable to utilize the research staff on these committees when other responsible resident officers are not available because of the inherent advantages of local rather than non-resident representation.

The significance of forestry in this planning movement is evidenced by the fact that in each of the four States in which the Station is represented, major attention has been given to forestry problems in one or more of the State committee meetings. This circumstance stands out in contrast to early development of the Agricultural Conservation Program where interest in forestry first appeared most prominently from the farmers themselves.

In Massachusetts a proposal for Federal acquisition of certain uneconomic farming units to consolidate and expand the area of the Hopkins Memorial Experimental Forest appeared as the first specific problem of land-use planning for committee consideration. The case was thoroughly discussed by the local committee (functioning on a town rather than county basis in Massachusetts) and was presented to the State committee with a favorable recommendation. This was endorsed and transmitted through the Soil Conservation Service to Washington for action under Title III of the Bankhead-Jones Act. Although the demand for funds for acquisition under this act is much greater than the amount available, the Hopkins Memorial Experiment Forest case is being given special consideration because of its peculiar significance in relation to the Department's cooperative planning program.

Farm Forestry

Another significant development in the field of cooperative relations was the initiation of the Norris-Doxey Farm Forestry program. This is closely related to the State and county planning effort. Confusion arose in some States at the outset from failure to work through the State planning committees in setting up Farm-forestry sub-committees. This resulted in some States insisting upon the right to name the committee membership rather than leaving each Federal agency concerned the privilege of designating its own representative. Because of this confusion as well as other reasons, the response to the farm-forestry program in the Northeast was not enthusiastic. In some instances the States expressed preference for administration through the Forest Service rather than the Soil Conservation Service.

Since research projects under this program are expected to correlate closely with demonstration projects, the experiment station has a direct interest in the formulation of state farm-forestry plans. Thus far, Rhode Island and Maine are the only northeastern states to accept the program without question. The state plan for Rhode Island was prepared by an unofficial sub-committee and accepted by the state planning committee with little discussion. A farm-forestry project has been set up in the county selected for unified program planning. New York put a comprehensive plan into effect after obtaining modification of the original policy with respect to requiring "complete farm plans." In Massachusetts an unofficial committee did some work on a state plan but the matter appears to have become quiescent after discussion at a state planning committee meeting led to appointment of a new sub-committee. In Connecticut initial inertia was overcome and some effort put on preparing a plan which would keep administration of the program in the hands of state agencies and which would concentrate on Extension work. Somewhat similarly, in New Hampshire an allocation of funds for increased extension work has been obtained but no plan for a demonstration project has been cleared. It is understood that material is in preparation for submission of a plan for Vermont.

In discussions of the farm-forestry program research has been put forward by state agencies as a primary need. Interest has centered around marketing and utilization studies. Connecticut agencies put up and obtained approval for a research project dealing with use of wood as fuel, while still in doubt about moving to accept other phases of the program. Because of past interest and an especially favorable local situation, Connecticut had the support of extension foresters in other states for this fuelwood project. In New York a research project dealing with market outlets available to farm woodlands of a specific locality was set up in advance of other phases of the farm-forestry program. Subsequent action correlates this project closely with the extension and demonstration activities. Inquiries regarding farm forestry research projects have been received from Maine, but as yet no application has come through.

Flood Control Surveys

In the prosecution of flood control surveys substantial progress may be recorded in respect to interbureau understanding. When this work was started the outlook of representatives of each bureau was more or less self-centered and limited to possibilities in their own field. Subsequent developments have brought much better appreciation of the many interrelated implications of the program and a more sympathetic cooperation among the field men. The bureaus have been drawn together in part by the common problem of establishing an economic justification for land-use programs in watersheds where primary benefits are to be achieved by construction of large dams by the Army. With the army dams skimming the cream of flood damage reduction, work on the watershed itself is left a very scant margin.

Locally, however, and especially in the Merrimack watershed, people have voiced serious opposition to the Army program. Loss of villages and important areas of tillable lands behind the large dams proposed is considered too big a price for the community to pay for benefits which accrue largely at other points. Interest is growing in an alternate program being developed by the Federal Power Commission to obtain equivalent flood control benefits from a larger number of smaller reservoirs placed farther up on tributary streams than the sites suggested by the Army.

New England Forest Emergency Project

As an aftermath of the 1938 hurricane Forest Service activities in New England have been on an entirely different basis than ever before. The greatly expanded burden of administrative and cooperative relations in the hurricane zone, except for the National forests themselves, has been handled by an emergency organization with headquarters at Boston and field units in each state. This inevitably involved some confusion in the minds of the public but has not created any difficulties in relations with the research organization.

After the fire hazard reduction work got under way the station prepared a statement of slash disposal standards based on silvicultural considerations. Among other things this suggested broadcast burning of certain areas during periods of favorable weather in order to remove dense accumulations of slash at reasonable cost. Although a trial of this practice was planned in New Hampshire, it failed to receive administrative sanction and was not used at all.

The Station's recommendations on slash disposal did, however, have an important place in the setting up of a special practice for benefit payment under the Department's Agricultural Conservation Program. Within the hurricane zone farmers were allowed payment at the rate of $3.00 per acre up to a maximum of $60.00 per farm for clean up of hurricane debris, not only as a matter of fire hazard reduction, but also for betterment of silvicultural conditions. The Station's standards were accepted as criteria of areas qualifying for payment and of satisfactory compliance.

The Station's work in fire danger evaluation was incorporated into a new fire danger meter prepared for application throughout the eastern mountain regions. The Station also cooperated in the establishment of the more intensive net-work of reporting points to localize weather bureau forecasts of fire danger in the hurricane zone. More recently cooperation of the Station was solicited in connection with an analysis of visibility as basis for rebuilding the lookout system in Massachusetts.

Salvage of Hurricane Timber

The timber salvage operations, extending into almost every community in the hurricane zone, have sharply emphasized the low average quality of New England's second-growth timber. Establishment of log-grades as the basis for purchase of timber was facilitated by previous studies of the Forest Products Laboratory and the Station in this field. The use of log grades has proven practical and has served to focus attention of land-owners on the advantage of forest management to produce timber of better quality.

The salvage operations also brought into relief the generally low level of operating and manufacturing practices in the region. Delivery of logs in lengths most in demand by the lumber trade was handicapped by lack of suitable trucking equipment. Importation of men and equipment to handle the tremendous volume of salvaged timber injected new life into logging and milling activities which in many communities had become almost a lost art. Manufacture of square-edged products, segregation of grades, and insistence on care in piling for seasoning, all impressed upon the public the low level which lumber manufacture in the region had previously reached in depending so largely on the box industry for its outlet.

The large volume of lumber and timber to be utilized directs major attention to the problems of marketing. While any deal which would provide a channel to move much of the hurricane timber out of the region in orderly fashion will be welcomed, the situation provides a challenge to all concerned to stimulate local consumption of home-grown products. The opportunity along this line is large because the region consumes so much more lumber than it produces. Practices adopted by the salvage administration to insure proper manufacture and seasoning should go far to offset existing trade prejudice against local products. Continuation of these practices should help local industries to meet effectively the problems of readjustment which must be met after the hurricane timber is gone. The Forest Products Laboratory has rendered valuable aid in this situation by assigning specialists to New England to cooperate in setting up the milling and seasoning practices and to analyze the local market situation.

With the aid of the Forest Taxation staff from the Washington Office, the Station has given some consideration to the extent of economic adjustment likely to be imposed upon rural communities as a result of the loss of timber in the hurricane. While it has been possible to make only a preliminary analysis of the tax situation in some of the towns where the hurricane did the most damage, some satisfaction can be drawn from the fact that readjustment will not generally be as serious as anticipated. In many towns forest values were so small a percentage of the total tax base that no drastic revision of tax rate is needed to offset the timber loss.

In Massachusetts, the local tax problem was much more seriously involved with other considerations, such as an increase in the state deficit. It appeared also that timber values were not generally assessed at high values in Massachusetts, especially when held in connection with farms. In one town where timber losses were most serious, the effect on tax base was minimized by the fact that a large proportion of the forest land had been listed under the timber tax exemption law.

In New Hampshire the effect of the hurricane on local tax rates was largely offset by abolition of a state tax. However, in several rural towns in New Hampshire the tax base was reduced from 25 to 40 percent, necessitating an increase of from $5.00 to $9.00 in tax rate. It is in such dominantly forest towns where total tax base is relatively small that the most serious problem exists. The full impact of the timber loss cannot be measured until the logs and lumber, most of which remained subject to taxation in 1939, are removed.

Forest Policy

Indirectly related to the state and county planning efforts and to the hurricane situation were activities in the region looking toward the formulation of forestry objectives and crystallization of an over-all forest policy for New England. The hurricane stimulated widespread public interest in the forests and brought the need for forest management into the public eye.

This gave impetus to discussions of legislation to provide public control of timber cutting. Such regulatory legislation had previously been proposed in Connecticut and Vermont. Following the hurricane, a proposal for establishment of forest conservation districts was drawn up, backed by the Governor and given a hearing before a legislative committee in Massachusetts. In New Hampshire, a series of discussions in which all interests, including representatives of the lumber and pulp industries, participated was held in an effort to formulate generally acceptable legislation. This activity in formulation of state legislation was in part a reaction against the prospect of Federal regulation. A growing number of New England people are ready to concede the need for forest regulation of some sort but most of them prefer that this be accomplished through the States rather than by the Federal government.

This attitude, coupled with proposals for Federal leasing of forest lands, led to the informal establishment of a New England Forest Policy Committee on which the various technical agencies were represented. This committee later united with the Committee on Agriculture and Forestry of the New England Council to adopt a policy which is intended to form a basis from which specific action programs may be developed. These committees adopted a

resolution calling for a survey of forestry activities by all agencies as the first step in correlation for a united effort. The New England Council committee, now headed by a technical forester, adopted the promotion of a comprehensive forestry program for New England as one of its major interests, after an earlier special committee had explored and defined the particular needs for forest products and marketing research.

The Northeastern Forest Research Council

All these currents and cross-currents in respect to forestry and agriculture react in turn upon our research advisory council. Our advisory council was formerly the dominant regional group in regard to forest policy and research program. With all the new committees and programs having their origin in activities of the Department of Agriculture during recent years, the Forest Research Council loses its prominence and question may well be raised as to whether it still has a place. The answer to such a question is affirmative because (a) the need to protect, guide, and promote Federal forest research is accentuated, (b) forest research must not be lost in the shuffle of numerous partially overlapping "action" programs, (c) the need for coordination of all agencies is intensified by the local attitude, and (d) local agencies may continue to need active stimulation, encouragement, and aid.

The keynote of the meeting of the Northeastern Forest Research Council held during December 1939 was recapitulation, evaluation, and reorientation. The Council made specific request for a summary of work under way by all agencies and an evaluation of past work of the Station itself. The mood of the Council was anticipated by the Station in preparing agenda for the meeting. The report on work in Forest Management showed that rounding out of past studies and reorientation for new work was occupying the staff in that field. Furthermore, regional analyses of activities and needs in the fields of research on forest products and forest wildlife relationships had been selected as the major topics for discussion by the Council. Specialists in these fields had been invited to the meeting and helped to give the Council a well-rounded view of what is going on in the region.

Federal-State Relationships

From all that has transpired during the past year, one significant fact may be clearly recognized. This is a growing tendency to seek solutions through State action with Federal aid, following the Clarke-McNary principle, rather than to open the doors for expansion of direct Federal action. This attitude has been reflected in the reaction toward research as well as toward other programs and plans. The New England Council, for example, while apparently convinced of the basic need for more forest products research, hopes to get results by stimulation of local institutions, especially the technical universities and land grant colleges. The land grant colleges themselves express the same tendency. Having evidenced

a keener appreciation of the place of forestry in the economy of northeastern agriculture, they appear ready to give forestry projects a larger place in the programs of the State experiment stations. The Federal experiment station, therefore, finds itself somewhat on the defensive, caught in the tide of reaction against expansion of Federal agencies and activities. However, its opportunity to display leadership in stimulation and correlation of work by other agencies has been improved. It may be anticipated that progress during the next few years will be more largely through cooperative projects than has been the case in the past.

FOREST MANAGEMENT

Forest management research has grown in a normal and healthy manner at the Northeastern Station, from a single project involving the spruce-fir type in 1923 to a division embracing silviculture of three forest types, forest planting, forest measurements, forest protection, and forest genetics. Its forward progress in silviculture and mensuration has been temporarily halted by the hurricane of September 1938 and a breathing spell has been necessary in order to readjust the program. A close scrutiny of past work indicates a tendency in recent years to expand on too broad a front in relation to funds available; it shows the large amount of time devoted to development of experimental forests and research centers and to facilitate work in connection with emergency funds such as WPA, ERA, and CCC. The result is that field stations that would normally have been developed very gradually were established and improved while these funds were available, necessitating the attention of project research men. Expansion of the research program may seem to have been retarded as a result of such activity but in the long run the work will be speeded up since better facilities for handling field work will have been provided.

A thorough analysis of problems involved and funds likely to be available to the experiment station is a logical step at this juncture in order to reorient and properly coordinate the program. Normal work on going projects during the past year has suffered slightly by the necessity of cleaning up the havoc wrought by the hurricane. Plots not discarded due to hurricane damage have been remeasured and experiments closed due to windfall damage are being reported upon. By midsummer of 1940 forest management investigations should be on a sound basis and ready to move forward once more.

Restoration of the experimental forests to permit resumption of an effective research program has proven to be a major task. First it was necessary to open blocaded roads and clean up and dispose of slash along roads and trails to reduce fire hazard. This was largely accomplished with CCC and ERA labor. A further reduction of debris was effected through numerous sales of down and leaning timber. One large sale on the Gale River Forest to the Parker Young Company of Lincoln, New Hampshire, for the bulk of the damaged timber has aided materially in the clean-up of that Forest.

The examination and remeasurement of hurricane-damaged areas indicated that losses were heavier in treated stands than in uncut stands. Softwood stands appeared to suffer heavier losses in the spruce and northern hardwood region than did hardwoods. Detailed data collected on a 1400 acre tract at Gale River, New Hampshire, showed a 25 percent loss of conifers as against a 19 percent loss of hardwoods on the same area. In the spruce region some 75 percent of the loss is in windthrown trees and 20 percent in trees leaning to such an extent as to preclude their survival.

On selectively cut plots in the northern hardwood type there was some indication of progressively greater loss with a decrease in time since cutting. Losses of 3, 10, 17, and 20 percent of residual stand were recorded on areas selectively cut 5, 4, 3, and 2 years, respectively, before the hurricane.

Silviculture

Spruce-fir

Studies in the spruce-fir type, begun in 1923, have yielded a wealth of information progressing from methods of securing natural reproduction through thinnings, weedings, and other cultural methods to proper methods of harvesting mature stands. Partial cutting experiments recently inaugurated and more recently destroyed by the hurricane were the latest phase of this work. These will be repeated. It is felt that spruce silviculture has reached the point where future work should aim to expand on the one hand toward fundamental research explaining the "Why" of facts uncovered, and on the other hand toward a certain amount of larger scale demonstration of methods developed. The latter type of work must be coordinated with studies of logging costs and other economic factors.

During the past year progress in spruce management studies must be largely measured in terms of salvage values. The extensive damage inflicted by the hurricane on nearly all phases of the work, placed definite checks on initiation of new work. For the time being the major concern was the rehabilitation of the going program, and progress in this respect has been encouraging. Restoration work resolved itself into two major tasks (1) a checking, clean up, and remeasuring of permanent sample plots distributed through the hurricane zone of the spruce region, (2) rehabilitation of the Gale River Experimental Forest on which an intensive research program in spruce management has been developed in the past 12 years.

Through the cooperation of Cornell University and the Soil Survey a soil type map was completed for both the Finch-Pruyn and Gale River Experimental Forests.

Northern hardwoods

Management studies in the northern hardwood types have been under way but a few years. Major efforts have been directed toward determining the extent to which selective or partial cutting may be substituted for the clear-cutting now in general practice. Initial work, well under way, was damaged severely by the hurricane and although much of value has been salvaged, a new start must be made on some phases. The Bartlett Experimental Forest has been developed with adequate headquarters for carrying the more intensive phases of the work and other experimental areas for less intensive research will be located. Results to date indicate the need for studies to determine possibilities of utilizing material of low grade or of small size, coordinated with the silvicultural research.

Studies now under way to determine the effects of thinnings, weedings, and mowings in the development of northern hardwood stands were not damaged to any great extent by the hurricane. Results following 5-year remeasurements in weeding experiments indicate that weeding is justified where a sufficient number of potential crop trees are present. Best results are obtained if stands are treated before they are ten years old.

To date the selection cutting experiments have emphasized how little is known of methods of harvesting northern hardwoods and indicate the desirability of well rounded, controlled experiments. Five year results obtained just prior to the hurricane show that there may be no acceleration in growth of the residual stand after selection cutting and that the growth rate varies considerably by species, sugar maple and white ash two of the most valuable species, making excellent growth while yellow birch may show a net loss due to mortality of trees bordering small openings in the stand. Hardwood reproduction grows satisfactorily only in the open, indicating that group selection may prove the best method.

Expansion of northern hardwood silvicultural research during the next year will include the establishment of a more complete set of harvest cutting plots and a cooperative effort in following results of selective cutting by the Otsego Forest Products Cooperative Association near Cooperstown, New York. Later expansion may involve an extensive study of results of past cuttings over the northern hardwoods region in an effort to provide valuable leads as to successful methods of cutting.

On the basis of information available silvicultural research on northern hardwoods is of high priority. The station has accomplished a great deal in the spruce-fir type and other agencies have done much toward solving the silvicultural problems of the white pine type. Little information is available for the proper silvicultural treatment of northern hardwoods or for that matter, of successful planting methods for hardwoods as will be brought out later.

White Pine

Funds for silvicultural research in the northern white pine type were made available two years ago. It is recognized that much has already been done in white pine silviculture but there are gaps to be filled, fundamental knowledge to be gained and large scale demonstrations of desirable practices to be made. The Massabesic Experimental Forest in Maine has been acquired for this purpose and also for the prosecution of studies in the field of forest economics and products. A comprehensive analysis of problems in white pine management and a long time plan of work for the Experiment Station's effort in this field is to be completed this spring.

Data from white pine plots, some of which were established as early as 1904 are being analyzed as rapidly as possible. Some of these, established to determine the effects of stand improvement measures give leads of value in attempting to prescribe for rehabilitation of hurricane-damaged white pine woodlands. On one set of plots in mixed pine and

sprout hardwoods established in 1914 the hardwoods were cut to release the pine and the stocking improved by planting some 2-1 white pine which were later released by cuttings in 1919 and 1923. Twenty-one years afterwards these stands were composed of a mixture of fast growing pine and better quality hardwoods whereas untreated plots show a smaller volume of pine and a poorer representation of commercially valuable hardwoods. These were indications that hardwood saplings left as trainers improve the quality of the pine.

Interesting information on the natural succession of pine-hardwood types on burned and unburned areas is being secured from these old plots.

During the coming year efforts will be pointed toward checking and correcting the pine project analysis and plan of attack on the basis of contacts with agencies engaged in silvicultural research. The program will be correlated with the work of other agencies to avoid duplication and to maintain proper cooperation.

Mensuration

Forest mensuration work has been under way since the station's establishment in 1923. As a result, volume tables for northeastern species are fairly complete, growth and yield studies of spruce-fir even-aged second growth stands, completed in 1928 are being checked on a long-term basis, and regional growth tables for northern hardwoods are nearing completion. Mensuration in future will logically become more of a service section advising on measurement technic and experimental design, and, also carrying on as projects under its own head, fundamental studies leading to a broader understanding of such factors as mortality and the approach of understocked stands toward normal stocking.

Some 78 plots totalling about 11 acres devoted to mensuration studies had to be discarded as a result of the recent hurricane.

The survey and type map project conducted by the CCC in southwest Maine for several preceding years, was omitted this season, relieving the Station of demands for technical advice which had helped to maintain high standards of accuracy in the past. Adequate material for the statistical control of the Regional Survey has been obtained and when the CCC project is resumed, the intensity of inventory will be reduced to a third or fourth of past practice. The data from this survey will furnish information of value in planning the silvicultural control of gypsy moth and will provide valuable leads for the forest survey organization when it is extended to the northeastern region.

Regeneration (Planting)

Owing to a curtailment of funds and the completion of certain phases of forest planting work the program in planting research is being reoriented along conservative lines. Work at present is directed toward an analysis of research completed during the past few years with subsequent reports and publications to come. Work during the next year will be confined to carrying going projects of value with an effort toward some expansion in hardwood mixture establishment which is of greatest importance. Although it is generally admitted that methods of establishment of conifers are well worked out, it is also common knowledge that little is known as to best methods of producing hardwood nursery stock or of out-planting hardwoods. Mixed stands of hardwoods and conifers are much to be desired but what the best mixtures are, the relative time of planting the species in mixture, and what methods should be used for planting hardwoods are problems needing solution. The Station's effort will be directed primarily along lines aimed at proper field planting methods, as other agencies are attacking the problems of nursery technic.

In the summing up of past work, results secured in partly completed analyses show that the initial efforts in establishing hardwood-conifer mixtures have shown promise with red oak and white ash, but results with black locust, black cherry and basswood have not been so good. Planting efforts in heavy competition or where drainage is poor have shown serious limitations with most species tested. Poisoning studies have determined the most effective time for poisoning, but the results leave much to be desired as to best practical procedure.

Preliminary observations of tests of Scotch pine from seed of known source planted under widely divergent site conditions indicate a variation in form which may be traceable to environment, but positive evidence requires longer observation. Study of planting procedures has shown the superiority of the dughole method of planting for general use, and that the Harvard tool must be restricted to stock of certain sizes and to the lighter soils. Improper depth of planting was found to be deleterious to survival and development when extremes were encountered, but normal departures from the depth in the nursery, where planters are reasonably careful, are not serious.

Forest-fire Protection

In order to meet the tremendous increase in forest-fire danger resulting from the hurricane of 1938, forest-fire control planning has been greatly accelerated throughout the Region and particularly in the area affected by the hurricane. The need for current information on forest-fire danger has been taken care of by the extensive system of forest-fire danger stations established by the New England Forest Emergency Project in cooperation with the State Forest-fire control agencies and the U. S. Weather Bureau. The Station assisted in this program by participation in the preparation of plans, establishing the Long Island Stations, and by maintaining fire-danger stations at all its experimental forests in the New England States. The Station will also give technical advice to the New England Forest Emergency Project in the lookout detection study that is being made in Massachusetts, and in the analysis of the 1939 fire and weather data.

The analysis of data collected in connection with an attempt to devise standard regional tables of forest-fire damage values for the northeastern oak region has shown that while the figures are not exact enough to be used for regional tables they indicate that appreciably greater damage is done by fires than hitherto reported. On the average the damage per acre to reproduction and timber was found to vary between $4.35 in the case of softwood cordwood stands and $2.54 for hardwood stands less than cordwood size. These appraisals are between 1.5 and 4 times greater than estimates of damage submitted by fire wardens.

In the investigation of the effect of scorching by fire on trees, 791 tagged trees have been under observation at five localities in the oak region from three to six years. Annual examination of these trees has shown that at the end of six years, about 28 percent of the injured trees surviving the fire show no after-effects of the scorching. Delayed mortality has removed 31 percent of the trees alive after burning, while 24 percent of the injured trees have been attacked by decay-causing organisms. The remaining 17 percent of the trees still alive show either insect infestations, have been attacked by both fungi and insects, or have open fire scars.

Genetics

The work of the forest genetics project can best be discussed under the four headings that follow:

Practical application

The new hybrid poplars which have been released to the Northeastern Station by the Oxford Paper Company have been through the initial stages of selection for such forest characteristics as rapidity of growth, hardiness, habit of growth, and resistance to disease. Since selection has been based on the growth and development of these hybrids in western Maine, their adaptability in other regions of the United States must still be determined. Cooperative tests of fifty-eight of these new hybrids in twenty-five Federal nurseries have provided uniform data on growth and development under a wide variety of climatic conditions. A preliminary survey of these data has furnished valuable information concerning the regional adaptation of some of these hybrids.

Heredity and Variation

Breeding and inheritance.-- In 1939 controlled breeding, involving self-pollination and pollination within and between species, was undertaken with Betula, Fraxinus, Pinus, Quercus, Tilia, Acer, Ostrya, and Magnolia. All controlled pollinations on Acer, Ostrya, and Magnolia failed to mature seed. A total of about 150,000 seeds were set to controlled pollination in Betula and about 2,000 in Fraxinus. Only 15 seeds matured to hundreds of crosses made in Quercus, and 150 to many crosses in Tilia. About 3,000 seeds were collected in the fall of 1939 from exploratory pollinations on Pinus made in 1938.

Individual variation.--Preliminary investigations on a group of trees at Williamstown, Massachusetts, indicate that the sap of individuals varies from 1 percent to higher than 4 percent in sugar content. These differences have been quite consistent during three seasons, and it appears that the individual variation may be heritable.

Racial variation.--Work on seed origin has been started with white pine and red pine in cooperation with the State nurseries in New York, Massachusetts, and New Hampshire, which are now growing seedlings from seed collected in the Eagle Lake region of Ontario, Canada. These seedlings, now two years old in the seedbeds, do not at present differ in growth and development from seedlings of local origin.

Cytological Aspects

From the standpoint of research in forest genetics cytological investigations are not an end in themselves, but provide information for the interpretation of the results of breeding and for planning the breeding work.

Chromosome investigations.--Preliminary work completed with 19 species of oak which may be used in breeding indicates that the somatic number is uniformly 24.

During 1939 an exploratory investigation was made on the occurrence of polyploid races of red maple. This work indicated that in the Canadian life zone there may be races of Acer rubrum with higher chromosome numbers than those found in races with a more southern distribution.

Physiological Aspects

Vegetative propagation.--Vegetative propagation of forest trees provides the means not only for immediate utilization of the best native trees or hybrids, but also for the multiplication and perpetuation of germ plasm necessary to a fundamental study of inheritance. Research on vegetative propagation has been extended to outdoor propagating beds, a method which can readily be adapted to commercial practice.

The results with chemical treatments of white pine in 1939 have been negative in that growth-promoting substances (so-called "hormones") have failed to stimulate rooting during the current growing season. White pine cuttings of the current year's growth taken early in the summer were still alive in the propagating beds, but had not rooted at the end of the first growing season. These cuttings have been mulched and left in the beds in an attempt to obtain rooting the second year.

An experiment to determine variation of rooting response to treatment with growth-promoting substances in red maple indicated that this characteristic is apparently inherent. The average rooting of cutting from different individual trees (clones) ranged from 18 percent to 98 percent.

Pollen storage and restoration of germinability.--A storage experiment with white pine and red pine pollen, started in the summer of 1939, indicates that optimum storage conditions for these species is approximately 25 percent relative humidity and 4° C. It was found that after storage at low humidities germinability of pollen could be restored by brief periods of humidification. White pine and red pine pollens responded differently to variations in temperature, suggesting a fundamental difference in the pollen of these two species.

FOREST PRODUCTS

Connecticut Farm Forestry Fuelwood Study

The problem of the utilization of low grade hardwoods, which are being produced in Connecticut at the rate of about 300,000 cords per year, is one which is in urgent need of solution, not only for the elimination of waste of a useful product but also because of its important bearing on the problem of forest stand improvement.

The field which seems to hold the most promise is in the use of these hardwoods as fuel. The Northeastern Forest Experiment Station furnishing technical supervision and cooperating with the Connecticut Agricultural Experiment Station, the Connecticut Forest and Park Association, the State Extension Forester and the Mechanical Engineering Department of Yale University is undertaking the investigation of the problem along several lines. Norris-Doxey cooperative farm-forestry funds were made available for this project.

Wood as a fuel must compete with coal and oil, a large portion of which is water-borne to Connecticut. Investigation into the possibilities of producing wood in a usable form as fuel and in quantity at a cost which will permit competition with fuels now in use are assuming the following lines:

(1) The production of wood in a hogged or chipped form by portable hogging equipment to make transportation easier and to adapt the fuel to stoker firing.

(2) The use of slow-combustion wood heaters for homes and small buildings.

(3) The reduction of fuelwood production costs by improved equipment and methods.

(4) The production of charcoal in portable kilns.

(5) The use of producer gas manufactured from wood as a means of supplying heat and electrical power for state and private institutions using large quantities of commercial power and other fuels.

The investigations were started, in an intensive manner, about three months ago. The preliminary work is well underway but definite results can not yet be reported except in regard to the slow-combustion heaters.

Produced commercially for but about six months, these heaters are found by most users to be the answer to a long-felt need for better heat, economy, and convenience in wood stoves. The original models have shown some defects under service conditions but these faults are being eliminated by the application of field observations to design and operation. The development of wood using equipment of greater-heating capacity and other uses is anticipated as a result of the work on the heaters now available.

FOREST ECONOMICS

Forest Cooperatives

In recent years there has been a growing realization of the need to study the principles of cooperative organization in the management of farm woodlands and the marketing of farm woodland products. The vital relationship of a constructive program of farm forestry and wood utilization to the larger problems of agricultural adjustment in the Northeast is involved and can hardly be overemphasized. Such a program offers the only real promise of making productive use of land and labor being released in the process of agricultural adjustment.

The economic situation in many rural communities of the Northeast is far from satisfactory. Mortgage debt has been increasing and farm income declining for many years. Rural relief costs have risen at an alarming rate, advancing in Otsego County, N.Y., a fairly typical area, from $6.00 per capita in 1932 to $25.00 per capita in 1938. Extensive land abandonment and disappearance of wood-using industries have reduced opportunities for employment and undermined entire communities.

Under such conditions cooperative organization of farm woodlands for sustained production offers two-fold community benefits, reacting on the farmers both as producers and consumers. As producers the farmers are afforded a stable market for such timber as may be removed from the woodland under sound forestry practices. Farmers will also realize higher sales income through adequate processing of their forest raw material for diverse outlets. Finally, employment in the transportation and processing of forest products, provides opportunity for additional income to woodland owners and their neighbors.

As consumers, the farmers benefit by obtaining from local sources and at reasonable prices much of the lumber required for rough and finished construction on the farms and for special uses such as wagon tongues and silo staves. Construction and repair of farm buildings has been in a state of stagnation, due largely to the relatively high cost of the lumber from other sections which now dominates eastern markets. Use of the lumber originating at a distance of 1500 to 3000 miles deprives local people of labor in preparing and transporting these products. Yet local woodlands contain sufficient softwoods to supply the bulk of such construction material for farm use provided adequate manufacturing facilities are available.

In view of the foregoing and other correlated facts, the Forest Service in 1935 initiated a study of the economic aspects of cooperative forestry in response to a legislative mandate growing out of a request for assistance from a group of interested farmers and business men at Cooperstown, N.Y. Concurrently the Otsego Forest Products Cooperative Association was incorporated by a local group as a means of realizing objectives here discussed. It constituted an experimental operation around which the essential economic studies could be centered. To provide a cooperative service in a field where other private industry has not functioned effectively, it seemed desirable to cover all operations from sound forest management to processing and sale of primary products to consuming industries. Equipment and facilities, flexible in arrangement and subject to control, were needed for investigations to work out net conversion values for many products and several species, and to determine best methods of organization, operating, and marketing. The Cooperstown enterprise, in short, was set up as a pilot plant to work out the many problems involved in efficient utilization and marketing of farm woodland raw materials and to obtain basic economic facts which would help chart the course for other forest cooperatives throughout the eastern hardwood region.

After local citizens subscribed about $4,000 in preferred stock, the Association was financed by loans from the Farm Security Administration aggregating $194,000. Federal financing of this project has exemplified to an unusual degree the benefit often cited for government spending in depression periods. Much of the labor employed would otherwise have been supported by relief funds, in which case it is unlikely that the expenditures would have provided a basis for permanent local employment. Substantial expenditures for machinery outside the community obviously contributed to employment in industrial centers.

While proceeding to construct a modern processing plant, a temporary mill was operated by the Association for two seasons to produce material needed for plant construction, to provide service to members and to gain operating and sales experience. Over a million feet were put through this plant. This formed the basis for developing more refined manufacturing procedures and for making definite market commitments. This phase of the work became possible because prior to completion of construction of the main plant, secondary manufacturing equipment was installed. Late in the past summer, the main plant was completed to the point where the machinery could be turned over.

The balance of the year was spent in making adjustments in operating procedures and machine installations. With the nearing of completion of the mill the problem of organizing production on a routine basis was faced. With the exception of one or two key men, practically all the labor was local labor, chiefly from farms. Most of these had never worked in a wood processing plant so that the training problem assumed considerable proportion. This remains one of the Association's problems.

In the meantime, the Station staff has continued its dual roll in technical research to guide the Association and in administration of the FSA loan. The low-cost method of inventorying woodlands and selecting trees which has been developed here was refined still further so as to include more detailed information at no increased cost. From the previous operating experience, log grades were revised. A preliminary study of quality increment was started. Time and cost studies were carried on in hardwood stands, yielding data on felling, bucking, and skidding costs under both heavy and light cuttings. Data were taken on which to base tractor operating contracts. Hauling studies for both logs and lumber were carried on. Cutting areas of 1939-40 were examined as a check on cutting practice. A simplified method stump tally was devised in this connection. An economic study covering general farm income, as well as costs related to forest products extraction, was made on approximately all the farms where cutting was done during the season of 1939-40. At the plant, after a study and report by J. M. Mathewson of the Forest Products Laboratory, detailed specifications for yard seasoning were prepared for the Association. Kiln drying studies of light and heavy squares dealing with kiln drying degrade and uniformity of drying were made. Considerable attention was given to dimension stock manufacturing equipment and layout and to recoveries of various items. A study of planing costs was made. The accounting system was refined so as to yield standard data for future production cost studies. Preliminary considerations were also given to the problems of mineral heart and stain in maple.

In connection with the Farm Security Administration loan, the Station staff supervised the budgeting, expenditure, and accounting for all funds, both from loan sources and from turnover. Very intimate contact was maintained with all the business activities of this pioneer association, and technical assistance was furnished on current problems. In addition, as a service activity and also to perfect the system, mapping, inventory, and marking of timber to be cut were done for the Association on lands of its members. Logging contracts during 1938-39 and 1939-40 totaled about 130, which brings the total number of operations to date close to 250.

This project appears to be a Mecca for visitors interested in the development of forest cooperatives. During the year there were well over 100 visitors. These included students from Yale and Syracuse, Under Secretary M.L. Wilson, and other Department officials, Congressmen Fulmer and Doxey, various state officials, private foresters, agricultural workers, and lumbermen. The management of the newly organized forest cooperative at Saratoga came to Cooperstown to study the operating principles, records, and field methods.

The course of development of the forest cooperative project at Cooperstown has not been too smooth. Inadequate estimates, failures of certain used equipment necessitated considerably more investment than originally anticipated; however, with a plant now functioning and personnel better trained, the operations of the Association are just reaching the point where they can begin to contribute basic economic information in a large way. In spite of difficulties encountered the project remains fundamentally sound in objective, scope, and development.

Outlets for Farm Forest Products

As part of the Norris-Doxey Farm Forestry program in New York State an analysis of outlets available for farm forest products from a specific economic unit in the white pine region adjacent to Lake Champlain has been inaugurated. This study is correlated with a forest farming demonstration project in the same territory.

For the current fiscal year the study will concentrate on an analysis of present and potential consumption of local forest products on the farms of four selected towns. This will be correlated with the amount which is now being grown on the woodlands of this area and with the amount these woodlands are capable of producing under sustained yield forest management. Following this a survey of sawmills and other wood using industries within economic hauling distance of the unit will be made in order to ascertain the extent to which existing industries may absorb balances in various species and classes of products which are not likely to be consumed locally. The results of this study should point the way for well-directed efforts to uncover or develop better balanced outlets.

FLOOD CONTROL SURVEYS

General

The Northeastern Forest Experiment Station has chairmanship responsibility for preliminary examinations and surveys for run-off and waterflow retardation and soil erosion prevention on the rivers of New England and the eastern part of New York State. Flood losses in this area resulting from the March 1936 flood were in excess of $130,000,000. The Station also participates in flood control activities on other watersheds in western New York State where the chairmanship is held by the Soil Conservation Service. Flood Control Surveys for both the Allegheny and Northeastern Stations are at present directed by Wm. Mollenhauer, Jr., who filled the vacancy left by the appointment of Arthur Bevan as Director of the Tropical Forest Experiment Station in Puerto Rico.

The surveys have all been handicapped by lack of experimental data on relation of character of vegetative cover to run-off. This emphasizes the need for a comprehensive, long-time program of forest influences research in the region.

Public Hearings

Flood control hearings, conducted jointly by the U.S.Engineers and the Northeastern Forest Experiment Station, have been held as follows:

Date	Place	River
1938		
November 4	Florida, N.Y.	Wallkill River and Cromline Creek
November 29	Fitchburg, Mass.	Nashua and Concord Rivers
December 15	Peterborough, N.H.	Contoocook River
December 20	Athol, Mass.	Chicopee and Millers Rivers
December 21	Concord, N.H.	Merrimack River
December 29	Contoocook, N.H.	Merrimack River
1939		
January 10	Springfield, Mass.	Connecticut River
January 11	Johnstown, N.Y.	Bellows Pond and Canada Lake Drainage Area
January 11	Hartford, Conn.	Connecticut River
January 17	Bellows Falls, Vt.	Connecticut River
January 18	Ballston Spa, N.Y.	Kayaderossas Creek, Fish Creek, and Saratoga Lake
January 18	Keene, N.H.	Connecticut River
July 25	Waterbury, Conn.	Housatonic River
August 3	Woonsocket, R.I.	Blackstone River
November 16	Albany, N.Y.	Mohawk River

The attendance at these meetings averaged 100 persons.

Preliminary Examinations

During the year 1939 preliminary examinations of the Connecticut and Upper Susquehanna Rivers were completed. In each case the Field Flood Control Coordinating Committee reached the conclusion that a serious flood problem existed and that there was a reasonable assurance that the Department of Agriculture could contribute to a flood control program. The floods of 1927, 1936, and 1938 caused direct damage on the Connecticut to the amount of $70,000,000, and took 42 lives. On the Upper Susquehanna River the flood of July 1935 took a toll of 32 lives, while that of March 1936 caused damage estimated by the U. S. Engineers at approximately $4,000,000.

Material which can be incorporated into preliminary reports on the Wallkill and Mohawk Rivers has been gathered. Uncertainties as to the reorganization of the Flood Control set-up have delayed progress on these reports.

Watershed Surveys

The report on the Merrimack River is nearing completion. With primary reduction of flood damages along the lower reaches of the main river afforded by large dams planned by the Army Engineers, construction of supplementary smaller storage ponds on headwaters does not appear to be economically justified. Damages from bank erosion are also insufficient to justify cost as a measure of flood control. Although many of the forests in the watershed were found to be of poor quality and only poorly or partially stocked, it has been difficult to determine what reduction in flood damages could be expected to result from improved forest management. It is apparent, however, that flood control benefits from a comprehensive forestry program will constitute a very small proportion of all benefits, which together can be shown to be substantially in excess of probable costs.

A detailed survey of the Connecticut River was begun in October 1939. Because of the lack of evaluation data, ways and means are being considered for attenuating the initial survey stages until actual field run-off data will be available from recent precipitation and run-off installations under various cover types.

The Northeastern Forest Experiment Station is also participating in the detailed surveys of Buffalo Creek and the Upper Susquehanna River which are being conducted under the chairmanship of the Soil Conservation Service. The report on Buffalo Creek is nearing completion and is being coordinated with that of the U. S. Engineers. On the Upper Susquehanna River four tributaries have been selected as being of high priority for detailed investigation and work is proceeding on the first of these areas, namely the Owego watershed.

FOREST INSECT INVESTIGATIONS

Forest Insects Laboratory, Bureau of Entomology
and Plant Quarantine, New Haven, Connecticut
R. C. Brown, Station Leader

The European Spruce Sawfly

Studies of this insect and the rearing and colonization of imported parasites has been the principal project of the station during the past year. Permanent sample plots have been established throughout the region for a detailed ecological study of the insect in different environments. Particular emphasis is being placed on a study of the natural factors which cause fluctuations in the sawfly population. Detailed studies are being carried on to determine the effect of defoliation on tree growth and mortality.

The detailed survey conducted in 1938 in cooperation with the States showed that the insect was present in practically all spruce stands and had reached outbreak proportions in northern and eastern Maine and in two areas in southern New Hampshire and Vermont. No general survey of the region was made in 1939 but special surveys were conducted in the areas of heavy infestation of the previous year. There was an increase in intensity of infestation in Maine. The areas of heavy infestation in southern New Hampshire and Vermont increased considerably in size. In these areas, however, where tremendous populations occurred, disease and overcrowding caused a high percentage of mortality of the larvae. Areas which were heavily infested in 1938 appeared to be in better condition in 1939, the infestation having moved to new areas. Thus far very few trees have died as a result of defoliation. The sawfly larvae prefer the old needles and practically all trees retain a portion of the current growth even in the heaviest infestations. During 1939 many millions of Microplectron fuscipennis, imported cocoon parasite of the sawfly, were reared and liberated by the States of Maine, New Hampshire, Vermont, and New York in cooperation with this Station. Experimental work was also conducted with a number of other species of parasites of foreign origin.

The Relation of Insects to the Deterioration of Hurricane-felled Timber

In cooperation with the Northeastern Timber Salvage Administration and the Harvard Forest a study was made of insect damage to windthrown white pine logs, in the forest, on storage sites, and in ponds. In general little damage by borers occurred to any timber sawed or put in ponds prior to August 1. Later in the season borer attack was severe in some areas but in general logs on dry sites suffered comparatively little damage, there being less than 2 percent of the logs attacked at many of the dry storage sites. Bark beetles were generally abundant throughout the season and consequently a considerable amount of blue stain was present in the logs. Ambrosia beetles and flat-headed borers were frequently noted but the damage caused by these beetles was slight. The insect damage to logs in ponds was negligible.

A rather extensive log spraying experiment was conducted on the Harvard Forest using a number of chemicals. None of the sprays applied were effective in preventing bark beetle attack. One of the sprays showed some promise in preventing borer attack although further tests will be necessary before definite conclusions can be drawn concerning the practicability of its use.

A survey of windthrown, mature spruce on the White Mountain National Forest revealed that the ostern spruce bark beetle, Dendroctonus piceaperda, was present in such small numbers that no menace occurs at the present time to adjacent stands.

Ecology of the Gypsy Moth

Detailed studies were continued on the Harvest Forest, Petersham, Massachusetts, and the State Forest at Freetown, Massachusetts, in an attempt to determine the natural factors effecting fluctuations in the population of the gypsy moth. The infestation was so light at the Natchaug State Forest in Eastford, Connecticut, that no detailed studies could be carried out. In this study a quantitative measure of the mortality of the various stages of the insect is being obtained and an attempt is being made to assign percentages of mortality to the various natural control factors which are operating.

Detailed observations were continued in the silvicultural plots at Petersham, Massachusetts, and on the experiment forest of the Northeastern Forest Experiment Station at Alfred, Maine.

These studies on the gypsy moth were set up on a long time basis and no statement on results will be given at this time.

Investigations of Insects in Plantations and Areas of Natural Reproduction

Many plantations are under observation for the purpose of determining the activity of a number of species of sawflies, some of which are of foreign origin. The life history of these sawflies is being studied as well as the effect of stand composition on their abundance and the damage resulting from defoliation. In the case of foreign species, parasites are being liberated in an attempt to bring about a greater degree of biological control. During the past season special attention was given to the study of direct control measures against Hylobius radicis, Hylobius pales (the pales weevil) and Pissodes strobi (the white pine weevil).

Investigations on Sucking Insects

Under this project a detailed investigation is underway to determine the effect of enzymes produced by scale insects on plant tissue. A study has recently been undertaken to measure the electrical potential of trees in varying degrees of decadence as an indication of susceptibility to insect attack.

An examination of beech trees in a large number of permanent sample plots in Maine showed that the beech scale, Cryptococcus fagi, was somewhat more abundant than in 1938. One heavily infested tree was found on the experimental forest of the Northeastern Forest Experiment Station at Bartlett, New Hampshire. This is the first time that the beech scale has been found in the White Mountain region of New Hampshire. This insect has, in recent years, spread over a large part of Westchester County, New York, and is now known to occur in Rockland County, New York, which is west of the Hudson River.

Forest Tent Caterpillar Investigations.

There are indications that the outbreak of this insect in Vermont is on the wane. For the past five years severe injury has been caused by this insect to maples, particularly those in sugar orchards. Parasitism of cocoons of this insect is high at the present time and a special effort will be made to determine the relative effectiveness of these insect enemies when the forest tent caterpillar infestation is light. It is believed by some investigators that parasites may be of greater importance in preventing an outbreak than in subduing it when it has reached epidemic proportions.

FOREST PATHOLOGICAL INVESTIGATIONS

Bureau of Plant Industry, New Haven, Connecticut
Dr. Perley Spaulding, in charge

Coppice Decay

That portion of the results of coppice decay studies relating to oak stands has been published as Technical Bulletin 684. That part relating to the northern hardwoods is in preparation for final publication.

Nectria Cankers

In the mass of data on the canker-forming Nectrias, some significant facts have been found bearing on their avenues of entrance. Branches are intimately associated with the majority of cankers. Inoculations and observations indicate that infection takes place in living or dying rather than completely dead branches. Branches more than one-half inch in diameter are not avenues of entrance unless infection occurs at the axil. Axillary cankers are common. The bark at branch axils is often more or less fissured. Experiments bending branches in the same manner as with heavy loads of ice or snow caused cracks in the bark of the axils which became infected when inoculated with a canker-forming Nectria. Dormant season injuries gave more infections than spring and early summer injuries, suggesting that prompt activity of the cork cambium helps to check early invasion by the fungus.

In a plot and strip survey of Nectria cankers in Connecticut, Massachusetts, New Hampshire, and Vermont it was found that all of the hardwood species, except beech, were cankered on many and severely cankered on some of the plots where they were present. Cankering was very irregular. One-third of the plots were free of cankers, about one-third had from 1 to 10 percent of the hardwood species cankered, and about one-third had 11 to 80 percent of the species cankered. Infection tended to be unduly concentrated on certain individual trees, indicating inherent differences between treesof the same species. Elevation was positively correlated with abundance of cankering, suggesting that exposure to wind, ice and snow storms is a favorable factor for the fungus. Discrimination against severely cankered trees seems desirable on genetic grounds, aside from their shorter life, lower value and effect as sources of infection spores.

Miscellaneous Diseases

The needle disease of Douglas fir caused by Adelopus gäumanni has been found in one or more localities in each of the states of New England. It has not yet been found elsewhere in the Northeast. How serious it may become for this species is uncertain.

The fungus Rehmiellopsis bohemica which has been known causing a blight of young needles of Abies concolor for a number of years, has been found attacking native Abies balsamea in a large area east of Rangeley Lake, Maine. Too little is yet known to predict its seriousness.

Damage to conifers, especially to white pine, by salt spray blown inland by the hurricane was severe along the coast. Some alarm was expressed, as needles died and fell prematurely, many white pines being nearly or entirely defoliated. Observations showed that the buds remained alive and put forth a new crop of leaves so that only a few subnormal trees were killed.

Sap stain in Timber Salvaged after 1938 Hurricane

The development of sap stain in hurricane timber was followed through the warm weather and examinations made several times with Timber Salvage Administration officers and Entomologists. Mold attacked newly sawn lumber generally about midsummer and dipping with anti-stain chemical solutions was recommended. Such dipping was applied at more than 100 mills, successfully preventing both mold and stain where the latter was not already present in the logs.

Advice was given Harvard Forest on end treatment of hardwood logs left scattered in the woods until summer. Paint, anti-stain chemical and an end coating compound to prevent stain and checking were used. The three treatments gave nearly the same protection from checking, stain being negligible. The lumber from the untreated logs was 57 percent checked while the treated ones yielded 30 to 33 percent checked after sawing and piling. The checking occurred in the lumber piles. Box piling gave the least checking. It was concluded that treatment with the end coating compound, of high grade logs on skidways, to reduce cost of labor, may be worth while.

Examinations were made of dry decked white pine logs treated by the Entomologists with various insect repellant materials. Most of the blue stain was distinctly correlated with burrows of the bark beetles and ambrosia beetles, comparatively little appearing to have entered through the ends or where large branches were cut off. On October 16 the blue stain was present in the sapwood of most logs in streaks 1 to 3 inches wide and extending inward to the heart wood. Expert scaling of the sawn lumber from these decks showed an average loss of $0.32 + per thousand board feet for logs which were in dry decks through the entire summer.

FOREST WILDLIFE RELATIONSHIPS

Bureau of Biological Survey
Department of the Interior
John Pearce, Assistant Biologist

Transfer of the Biological Survey from the Department of Agriculture to the Department of the Interior on July 1,1939, was effected without change in the program at this Station.

Perhaps the principal development during the past year has been the pronounced increase in requests from administrators of both public and private forests for aid in wildlife management. This aid has usually been in the form of recommendations, based on examination of the areas and the work in progress, suggesting practices for improving food and cover. Underlying each suggestion is the idea of fitting the suggested procedure in with other work on the forest. These requests indicate a growing trend on the part of a forest-minded group toward more emphasis on the wildlife aspects of forest lands.

The investigative work outlined last year continued with emphasis on the experiments with game food shrub plantings to ascertain the best methods for securing self maintaining clumps. A total of 5,000 shrubs were used last spring. One fact which has emerged from this work is the unsuitability of unculled 1-0 stock for experimental planting. Unless culled it varies so widely in size and vigor as to cause unreasonable variation in survival and thriftiness.

Trials of a deer repellent for conifer plantations concluded in May, showed a very definite repelling effect. The results open the way for promising investigation by laboratory chemists.

The Pillsbury Reservation studies suffered the loss of the grouse "escape lane" work initiated in 1935. The 1938 hurricane effectively closed most of the lanes. Final summary of the work showed that the nature of the brush or ground cover is most important when such lanes are created for grouse. Certain species such as spirea and alder if present in even moderate numbers, tend to take over the openings and make them unattractive to grouse.

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PATENTS GRANTED

To: L. H. Reineke for Core Holding Instrument.
No. 2160988, June 6, 1939

PERSONNEL

Northeastern Forest Experiment Station
February 1, 1940

	Grade	Title
ADMINISTRATION		
C. Edward Behre	P-6	Director
Mary E. Turrell	CAF-6	Principal Clerk
Julia J. Braun	CAF-4	Clerk-Stenographer
Catherine A. Heaphy (5 mo.)	CAF-4	Clerk-Stenographer
Esther S. Moos (1 mo.)	CAF-4	Clerk-Stenographer
Marian M. Thomas	CAF-4	Clerk-Stenographer
Ruth Baum	CAF-3	Assistant Clerk
Katherine A. Fitzgerald	CAF-3	Assistant Clerk
Lillian M. Antell (2 mo.)	CAF-2	Junior Stenographer
Mary E. Kelley	CAF-2	Junior Clerk-Typist
FOREST MANAGEMENT		
Raymond F. Taylor	P-5	Senior Silviculturist
Silviculture		
M. Westveld	P-5	Senior Silviculturist
M. A. Huberman	P-3	Associate Silviculturist
Victor S. Jensen	P-3	Associate Silviculturist
Harold Morey (4 mo.)	P-2	Assistant Silviculturist
Konstantin T. Belotelkin	P-1	Junior Forester
Alfred N. Dodd	P-1	Junior Forester
Raymond Ellstrom	P-1	Junior Forester
Arthur C. Hart	P-1	Junior Forester
Halsey M. Hicks (2 mos.)	P-1	Junior Forester
Kalervo N. Maki	P-1	Junior Forester
Basil A. Plusnin (6 mos.)	P-1	Junior Forester
Theodore S. Coile	SP-5	Field Assistant
Gordon M. Day	SP-5	Agricultural Aide (Forestry)
J. Walter Hendrix	SP-5	Field Assistant
Carlisle R. Saxton	SP-5	Engineering Draftsman
George E. Doverspike	SP-4	Assistant to Technician
Arthur E. MacGregor	SP-4	Assistant to Technician
George R. Trimble, Jr. (6 mo.)	SP-4	Assistant to Technician
Paul W. Warlich	SP-3	Junior Field Assistant
Robert E. Edwards	SP-2	Under Asst. to Technician
Roswell D. Carpenter (7 mo.)	SP-1	Junior Forester
Mary C. Weldon (7 mo.)	CAF-5	Senior Clerk
Alice K. Swain (8 mo.)	CAF-3	Assistant Clerk
Jack I. Greenhouse	CAF-2	Junior Statistical Clerk
Dorothy Johnstone	CAF-2	Junior Statistical Clerk
Joseph E. Marcus	CAF-2	Junior Statistical Clerk

Mensuration

L. H. Reineke (6 mo.)	P-4	Silviculturist
Mary C. Weldon (5 mo.)	CAF-5	Senior Clerk

Regeneration

L. H. Reineke (6 mo.)	P-4	Silviculturist
Frank E. Cunningham	P-1	Junior Forester

Forest Fire Protection

Paul W. Stickel	P-4	Silviculturist

Forest Genetics

E. J. Schreiner	P-4	Silviculturist
A. G. Snow, Jr.	P-2	Asst. Plant Physiologist
John W. Duffield	P-1	Junior Forest Ecologist
Theodore F. Breon	SP-4	Assistant to Technician
Stephen Lawler	SP-4	Assistant Field Assistant
Harold F. Ford	SP-4	Assistant to Technician
Grace Moskowitz	CAF-3	Assistant Clerk

FOREST ECONOMICS

C. R. Lockard	P-4	Forest Economist
M. B. Dickerman	P-2	Assistant Forester
Donald E. Rulison	P-1	Junior Forester
Gordon L. Chute	SP-4	Assistant Field Assistant
Merton L. Dawley	SP-4	Assistant to Technician
Harry B. Price	CAF-3	Asst. Clerk-Stenographer

FLOOD CONTROL SURVEYS

Arthur Bevan (2 mo.)	P-5	Senior Agricultural Economist
William Mollenhauer (4 mo.)	P-4	Forester

Preliminary Examinations and Supervision

Benton MacKaye	P-4	Conservationist
David W. Lippert (8 mo.)	P-1	Junior Forester
Halsey M. Hicks (3 mo.)	P-1	Junior Forester
Andrew J. Nelson	SP-4	Asst. Eng. Draftsman (Mech.)
Helen Wienhusen	CAF-3	Asst. Clerk-Stenographer
Laura Lewis	CAF-2	Junior Stenographer

Merrimack River

Kenneth L. Roberts	P-3	Associate Conservationist
Walter K. Starr (4 mo.)	P-3	Associate Conservationist
J. Harold Bauer (4 mo.)	P-2	Assistant Engineer
Nicholas Ball, Jr. (2 mo.)	P-1	Junior Engineer (Civil)
Bertram C. Goodell (4 mo.)	P-1	Junior Forester
David W. Lippert (3 mo.)	P-1	Junior Forester
Theodore R. Jones (4 mo.)	P-1	Junior Forester
M. B. Bruce (detail)	SP-8	District Forest Ranger
John A. Downs	SP-4	Asst. Field Assistant
Herbert P. Orland	SP-4	Asst. Field Assistant
Richard M. Sawyer (4 mo.)	SP-4	Asst. Eng. Draftsman (Mech.)
H. Roger Slayback (4 mo.)	SP-4	Assistant to Technician
George H. Aurelio	SP-2	Under Field Assistant
Almon D. Quick	SP-2	Under Field Assistant
Ernest E. Thompson	SP-2	Under Field Assistant
Evelyn C. Emerson (4 mo.)	CAF-3	Assistant Clerk-Stenographer

Buffalo and Codorus Creeks

C. H. Stoddard, Jr.	P-2	Assistant Forest Economist
Sidney Grossman	P-1	Junior Forester

Connecticut

Walter K. Starr (8 mo.)	P-3	Associate Conservationist
J. Harold Bauer (8 mo.)	P-2	Assistant Engineer
Harold F. Morey (8 mo.)	P-2	Assistant Silviculturist
Nicholas Ball, Jr. (8 mo.)	P-1	Junior Engineer (Civil)
Halsey M. Hicks (7 mo.)	P-1	Junior Forester
Theodore R. Jones (8 mo.)	P-1	Junior Forester
Basil A. Plusnin (6 mo.)	P-1	Junior Forester
George R. Trimble, Jr. (6 mo.)	P-1	Junior Forester
Richard M. Sawyer (8 mo.)	SP-4	Asst. Eng. Draftsman (Mech.)
H. Roger Slayback (8 mo.)	SP-4	Assistant to Technician
Evelyn C. Emerson (8 mo.)	CAF-3	Asst. Clerk-Stenographer

Susquehanna

Charles H. Diebold	P-3	Associate Forester
Edward B. Williams	P-2	Assistant Forester
Marshall T. Augustine	P-1	Junior Forester
Herbert J. Mols	P-1	Junior Forester
Charles E. Critchfield	SP-4	Asst. Field Assistant

FARM FORESTRY

Connecticut

Allen W. Bratton	P-2	Assistant Forester

New York

Roswell D. Carpenter (5 mo.)	P-2	Assistant Forester
Frank S. Griswold	P-1	Junior Forester

RS-NE
SILVICULTURE
Harvest Cuttings
(M-1)

February 1, 1940

METHODS OF CUTTING IN THE SPRUCE REGION

1. Field Division: Forest Management.

2. Work Project: Silviculture.

3. Line Project: Harvest cuttings, Spruce Types

4. Purpose: To determine best regeneration methods and cutting techniques for developing all aged spruce stands best suited to integrated pulpwood and sawtimber production.

5. Review of past work: The technique for regenerating the commonly occurring spruce stands having an abundance of advance reproduction has been developed. Successful management consists mainly in protection of young growth from logging damage, subsequent windthrow, fire and from excessive shading and crowding by hardwoods, regeneration of dense, even-aged immature spruce and fir and of stands running heavily to hardwoods is more difficult. Results of studies underway indicate that removing $\frac{1}{4}$ to $\frac{1}{2}$ the stand 10 to 15 years previous to the final cut results in good reproduction. Inadequate softwood reproduction in stands containing strong admixtures of northern hardwoods involves a problem not yet solved. Changed seedbed conditions, dense hardwood sprouts, and invading brush growth discourage spruce and fir reproduction following cutting of spruce stands. Heavy slash smothers advance reproduction beneath it. Analysis of slash data shows that slash decay is correlated with age, aspect, elevation and steepness of slope. Softwood slash may sometimes constitute an abnormal fire hazard for 15 or 20 years.

6. Accomplishments during past year: New partial cutting experiment started, to supplant experiment ruined by hurricane. Data compiled on hurricane-damaged plots.

7. Plans for next year: Reanalysis of project in light of hurricane losses. Completion of progress reports and articles for publication. Cutting on small scale partial cutting plots set up in 1939. Location survey of set of new large-scale partial-cutting plots to replace those destroyed by hurricane.

8. Date of completion: Continuous.

9. Assignment: M. Westveld.

RS-NE
SILVICULTURE
Harvest Cuttings
(M-4) February 1, 1940

METHODS OF CUTTING IN NORTHERN HARDWOODS

1. Field Division: Forest Management.

2. Work Project: Silviculture.

3. Line Project: Harvest Cuttings: Northern Hardwoods.

4. Purpose: To determine the relative merits of clear-cutting, tree selection, and group selection cutting methods in the northern hardwoods type.

5. Review of past work: On each of four successive years 5-acre plots in many-aged northern hardwood types were cut selectively, removing 25% to 35% of the basal area. Comparison plots were clear-cut during three successive year . On a comparable 40-acre block group selection cuttings involve the clearing in small openings of about one-eight of the total area.

Five years after selection cutting no change in growth rate of reserved stand was observed. Variation in growth rate of species was very noticeable, sugar maple and white ash making excellent growth, while yellow birch showed a net loss. Mortality of trees bordering small openings more than offset the growth of living trees. As hardwood reproduction grows satisfactorily only in the open, it is a minor consideration in selective cutting. Holes in the upper canopy would normally close as the residual stand develops.

6. Accomplishments during past year: After the 1939 growing season 5-year remeasurements were obtained on the second pair of clear and selectively cut plots. A recheck of the residual stands on selectively cut plots showed that 3 to 20 percent of the volume was lost as a result of the hurricane.

The progressively greater losses, 3,10, 17, and 20 percent of the residual stand on areas cutover 5, 4, 3 and 2 years before, may to some extent be coincidental. On individual 1/4 acre sub-plots the initial cut plus hurricane damage removed as much as 75% of the original volume. Badly damaged sub-plots will be retained, at least temporarily, as they provide an indication of development after over-cutting.

7. Plans for next year: Reports on 5-year remeasurements of two selective and two clearcut plots and on the development of reproduction following the removal of the overstory under tree selection, clear-cutting, and group selection will be prepared in 1940. The harvest cutting program in northern hardwoods will be taken up where dropped following the 1938 hurricane. Cutting started in September 1938 will be completed on a 5-acre selection plot. Boundaries of the group plots established but uncut in 1938 were modified after the hurricane; these will be cutover in 1940. Additional work in harvest cuttings will probably be undertaken in Otsego County, New York and in the White Mountains during 1940.

8. Date of completion: Continuing project.

9. Assignment: Victor S. Jensen.

 February 1, 1940

METHOD OF CUTTING IN WHITE PINE REGION

1. Field Division: Forest Management.

2. Work Project: Silviculture.

3. Line Project: Harvest Cuttings: White Pine Types.

4. Purpose: To determine the relative merits of different harvest cutting methods in white pine types, in terms of natural reproduction and factors affecting such reproduction.

5. Review of past work: The permanent sample plots, established in 1906 and later, to study the development of natural reproduction following clear cutting and partial cutting, have been remeasured regularly.

6. Accomplishments during past year: Computation and analysis of data from old plots under way. Hurricane-damaged plots remeasured. Project analysis and long-time project plan being prepared.

7. Plans for next year: Complete analysis of old Forest Service plots. Perfect project problem analysis and project work plan with cooperation other agencies engaged in white pine research. Complete case study of Clark lot cutover selectively for many years.

8. Date of completion: Continuous.

9. Assignment: M. A. Huberman.

RS-NE
SILVICULTURE
Stand Improvement
(M-1)

February 1, 1940

STAND IMPROVEMENT IN THE SPRUCE REGION

1. Field Division: Forest Management.

2. Work Project: Silviculture.

3. Line Project: Stand improvement in spruce types.

4. Purpose: To develop measures for increasing the production and growth rate of spruce and fir, and improving the quality of growth.

5. Review of past work: Girdling of defective overtopping hardwoods, shown to be economical and effective method of increasing growth rate of spruce, widely adopted as a measure of stand improvement. Thinning of old-field spruce stands also shown to be a practical measure for increasing annual increment. Experiments in weeding of young spruce stands on cut-over areas and of thinning at later stages are under way. Selective pruning of crop trees to improve the quality of sawtimber yield is also in progress. Elimination of undesirable tree growth from planting sites, plantations, and stands of natural reproduction by poinsoning and girdling has been studies. Poisoning, while killing the trees, often fails to prevent subsequent sprouting or root suckering. With aspen, girdling without notching is most effective in eliminating root suckers.

6. Accomplishments during past year: No new work started. Main efforts directed to restoring the research value of permanent sample plots not damaged beyond repair by the hurricane. Considerable progress made in compiling and summarizing data obtained in the remeasurement of hurricane damaged plots.

7. Plans for next year: The serious inroads on the stand improvement project by the hurricane will necessitate reorientation of the program. This will be done in connection with a revision of the spruce problem analysis and project work plans now in progress. Primary attention will be given during 1940 to completing analysis of data accumulated on various phases of the project and to preparation of progress reports. New thinning experiments, following in principle the work destroyed at Gale River will be established if a suitable location can be found, also studies in weeding, girdling and releasing will be continued.

8. Date of completion: A continuing project based largely on permanent sample plots. Progress reports will be prepared from time to time.

9. Assignment: M. Westveld.

RS-NE
SILVICULTURE
Stand Improvement
(M-4)

February 1, 1940

STAND IMPROVEMENT IN NORTHERN HARDWOODS

1. Field Division: Forest Management.

2. Work Project: Silviculture.

3. Line Project: Stand Improvement in Northern Hardwoods.

4. Purpose: To determine the effects and feasibility of thinnings, weedings, and mowings in the development of northern hardwood stands.

5. Review of past work: In a thinning experiment initiated in 1932 involving instrumental records of changes in environmental conditions, some yellow birch showed signs of decadence after the second growing season but otherwise appeared thrifty and are developing satisfactorily. On the basis of 5-year records, the residual stand as a whole increased in volume about 4 percent annually; even yellow birch in spite of losses from exposure showed an increase in net volume three times as great on the thinned as on the check area. Evaporation and wind movement at first increased more than 50 percent as a result of the heavy thinning but again approached normal as the stand closed. Other plots afford comparison of different degrees of thinning in even-aged 40- and 60-year stands.

Weeding experiments involving twenty-one intensive plots indicate that where a sufficient number of potential crop trees are present to justify weeding, best results are obtained if stands are treated before they are 10 years old. For at least the first 5-years after treatment weeding out only stems overtopping or actively competing with crop trees seemed preferable. A heavy weeding was more expensive and damage to crop trees by snow was greater. In some cases a considerable opening up around crop trees radically altered the ratio between height and diameter growth; the former remaining practically constant while diameter and crown size increased abnormally.

6. Accomplishments during past year: Hurricane damaged trees removed on the experimental thinning areas and recheck made of residual stand. Hurricane losses on the 60-year old thinned area varied from zero to more than 90%. As a result of this loss light thinnings are no longer well represented and the experimental plot area was reduced about 20% by elimination of badly damaged sections.

7. Plans for next year: Initiation of first of a series of weeding experiments on areas clearcut since 1933. Report to be prepared on the birch thinning experiment. Five-year progress report to be prepared on the weeding phase of the project.

8. Date of completion: Weeding 1950.
Mowing 1943.
Thinning - continuous.

9. Assignment: Victor S. Jensen.

RS-NE
SILVICULTURE
Stand Improvement
(M-3)

February 1, 1940

STAND IMPROVEMENT IN WHITE PINE

1. Field Division: Forest Management.

2. Work Project: Silviculture.

3. Line Project: Stand Improvement; White Pine Types.

4. Purpose: To develop measures to increase increment, quality and volume production of white pine types.

5. Review of past work: Thinning and weeding studies were begun in 1906 and additional work on established plots was started in 1930. Experiments in silvicultural control of gypsy moth were set up in 1937 on the Massabesic Experimental Forest and on the Wendell State Forest in Massachusetts. Yale University, Harvard Forest, and Vermont Agricultural Experiment Station have made comprehensive studies and have reported on cleanings, release cuttings, thinning, and pruning in white pine.

6. Accomplishments during past year: Preparation of several progress reports on some permanent sample plots in New Hampshire brought out the advantages of cleanings in birch stands, early release cuttings in mixed pine and sprout hardwoods, and showed the effect of a spring fire on succession in aspen stands.

7. Plans for next year: No new work will be undertaken until records of all permanent sample plots are analyzed to decide on continuing or abandoning plots until progress reports are prepared; and all useful material extracted for publication. Project problem analysis will be completed and priorities determined.

8. Date of completion: Continuous.

9. Assignment: M. A. Huberman.

RS-NE
SILVICULTURE
Silvics
(M-1)

February 1, 1940

SLASH STUDIES IN THE SPRUCE REGION

1. Field Division: Forest Management.

2. Work Project: Silviculture.

3. Line Project: Silvics: Ecology of Slash in Spruce Types.

4. Purpose: To determine the effect of slash on reproduction and the rate of slash decay and its relationship to the protection of forests from fire.

5. Review of past work: Studies show that dense softwood slash not only kills advance reproduction beneath it but effectually prevents the establishment of new reproduction for a period of fifteen to twenty years. Hardwood slash rarely hinders reproduction seriously for more than five or six years. The rate at which slash decomposes varies greatly with respect to species, as well as size of material. Beech, birch, and maple slash decomposes from two to three times as fast as spruce and fir. Studies of spruce slashings indicate that spruce slash persists as an abnormal fire hazard for an unexpectedly long period. From fifteen to twenty years or more must transpire before spruce slashings may be considered safe.

6. Accomplishments during past year: Work last year was confined largely to a field check-up on data secured the previous two seasons on the intensive study in spruce slashings on the White Mountain National Forest to determine the influence of decay on fire hazard.

7. Plans for next year: Further examination of slash areas is planned during 1940 to obtain additional data on the effect of slope and aspect on rate of slash decay.

8. Date of completion: Indefinite.

9. Assignment: P. Spaulding, J. R. Hansbrough, and M. Westveld.

RS-NE
SILVICULTURE
Silvics

February 1, 1940

PHENOLOGY

1. Field Division: Forest Management.

2. Work Project: Silviculture.

3. Line Project: Silvics: Phenological observations on forest vegetation in the Northeast.

4. Purpose: To obtain observations on the leafing, flowering, and fruiting habits of forest trees, shrubs, and herbaceous vegetation throughout the region, and to correlate such observations with climatic conditions and other natural phenomena such as forest fires, rise and fall of insect activities, increase or decimation of wildlife populations, fruiting and spread of fungi, et cetera.

5. Review of past work: (a) Since 1930, when this project was initiated, forty individuals and institution and sixty Civilian Conservation Corps camps have taken observations of the leafing, flowering, and fruiting of selected forest vegetation.

(b) Fairly complete meteorological records are being obtained at the Gale River and Bartlett Experimental Forests and the Cherry Mountain experimental area on the White Mountain National Forest; the Hopkins Memorial Experimental Forest at Williamstown, Massachusetts; the Chenango Experimental Forest at Norwich, New York; and the Massabesic Experimental Forest at Alfred, Maine.

In addition to the regular seasonal observations miscellaneous observations on the effects of the 1938 hurricane and relative windfirmness of various species were compiled.

6. Accomplishments during past year: The regular seasonal observations were received from cooperators, but nothing was done on the compilation of these data during 1939.

7. Plans for next year: It is anticipated that during 1940 the data accumulated over ten years will be compiled and analyzed to determine the value and advisability of continuation of this line project.

8. Date of completion: Termination of cooperative observations tentatively set for 1940.

9. Assignment: E. J. Schreiner.

R8-NE
MENSURATION
Tree Studies
(ME-3)

February 1, 1940

VOLUME TABLES FOR NORTHERN HARDWOODS

1. Field Division: Forest Management.

2. Work Project: Mensuration.

3. Line Project: Tree studies -- volume tables for northern hardwoods.

4. Purpose: To prepare regionally-applicable volume tables for the important northern hardwood species in terms of customary units of measurement.

5. Review of past work: Tables have been prepared for white ash, sugar maple, paper birch, yellow birch, beech, giving merchantable volume in cubic feet, in board feet by Scribner rule, and in board feet by International 1/4-inch kerf rule, by diameter and merchantable length. Tables for total volume in cubic feet of stem and branches have been prepared for the same species and for red maple. Complete measurements have been made of 308 trees for cordwood volume table purposes, and 77.5 cords of hardwoods have been piled repeatedly in various forms to study variations in piling, effect of species, and tree size on solid contents of stacked wood, and effect of bucking into shorter lengths on solid contents. Data have been assembled showing additional volume available with decrease of utilization limits from six to four inches, for correction of tables based on a 6-inch top diameter.

6. Accomplishments during past year: No additional material became available for incorporation in tables.

7. Plans for next year: Additional checks on the merchantable volume tables will be sought and any desirable corrections incorporated in the tables. Cordwood tables will be extended to include larger diameter classes as data become available.

8. Date of completion: 1941.

9. Assignment: L. H. Reineke.

RS-NE
MENSURATION
Stand Study
(ME-2)

February 1, 1940

GROWTH AND YIELD OF SPRUCE AND FIR

1. Field Division: Forest Management.

2. Work Project: Mensuration.

3. Line Project: Stand study--spruce and fir growth and yield.

4. Purpose: To prepare normal yield tables for even-aged second-growth stands of red spruce, pure and in mixture with balsam fir, to determine the approach to normality of understocked stands; to provide a basis for prediction of growth of spruce and fir on cut-over lands; and to prepare tables of growth which will be applicable over the whole spruce region of the Northeast.

5. Review of past work: U.S.D.A. Bulletin 142 was published in 1929, giving tables of yield for fully stocked, even-aged, second growth, stands of spruce and fir, Twenty-one sample plots are being maintained in New Hampshire and Vermont to check these tables and to provide information on mortality, change in composition, and the rate at which understocked stands approach normality. A special analysis of growth in northern Vermont and New Hampshire was made in 1936 for the Coos-Essex cooperative sustained-yield project. Data from some 400 plots on cut-over lands have been analyzed statistically to derive a mathematical expression of the volume of spruce and fir on cut-over lands, as a function of time since cutting, density, (as indicated by the relation between number of trees and their average diameter) and composition (as indicated by proportion of the total basal area represented by spruce and fir).

6. Accomplishments during past year: Plots not sufficiently damaged by the hurricane to cause abandonment were remeasured and cleaned of windthrown trees.

7. Plans for next year: Establish additional plots in understocked stands as opportunity presents. Relocate, if possible, the temporary plots measured for the normal yield tables, and remeasure for check on tables. Complete report on growth on cut-over lands. Prepare report on regional growth analysis.

8. Date of completion: Indefinite.

9. Assignment: L. H. Reineke and M. Westveld.

RS-NE
MENSURATION
Stand Study
(ME-3)

February 1,1940

GROWTH AND YIELD OF NORTHERN HARDWOODS

1. Field Division: Forest Management.

2. Work Project: Mensuration.

3. Line Project: Stand studies, composition, growth, mortality and yield of northern hardwoods.

4. Purpose: To provide the factual information required as to kinds, sizes, and quantities of forest products which will be produced within a given period of time so that forest management can be directed toward maximum value return under sustained yield handling of northern hardwood stands.

5. Review of past work: Fifty-two permanent plots and 114 extensive plots established in Maine, New Hampshire, Vermont, and New York, most of which were remeasured once. Records covering 30 years available for a number of plots. The 1932 survey of Bartlett Experimental Forest plus some 5,000 cores from 128 plots measured for Coos-Essex and Tioga cooperative projects provide basic data for growth prediction. A special study of mortality on large number of 1932 plots provide data never before available for growth prediction in northern hardwoods. Increment core examining device for use in field or office invented and patented. A system for accumulating mortality and disintegration data instituted. Four permanent plots were abandoned as a result of the damage by the hurricane of 1938, and five others were damaged appreciably.

6. Accomplishments during past year: Most of the plots damaged by the 1938 hurricane will be restored to useful condition by removal of debris, but one had to be abandoned. Remeasurement of hurricane-damaged plots completed and data partly analyzed.

7. Plans for next year: Maintenance of all plots for study of yield of even-aged hardwoods will be continued. A report will be prepared on standards for prediction of growth in the spruce and northern hardwood region.

8. Date of completion: Regional growth Report and Yield Tables, 1940 Yield study plots to be continued.

9. Assignment: L. H. Reineke

February 1, 1940

PLANTING

1. Field Division: Forest Management.

2. Work Project: Regeneration.

3. Line Project: Planting.

4. Purpose: To determine most desirable types of plantings and to devise techniques that will improve plantation survival and growth.

5. Review of past work: Regional survey of plantations conducted in 1931 and 1932. Study of relation of method and depth of planting to survival and growth initiated in 1932. Tests of the response of a single strain of Scotch Pine to various site conditions were initiated as cooperative effort in 1932. Planting of mixtures of conifers and hardwoods in strips begun in 1933, and tests of groupwise arrangements begun in 1935. Poisoning of undesirable tree growth tested. Floristic study of wet areas carried on in 1935 with field tests of species and stock for planting in such areas. Nursery tests on density of sowing of coniferous seed begun in 1936. Experiments were initiated in the establishment of rooted and non-rooted cuttings of 5 clones of hybrid poplars.

6. Accomplishments during past year: Additional plantings required in the mixed conifer-hardwood experiment were made, and stock grown at various densities in the nursery was outplanted. A test of root-proliferation, as an aid to hardwood establishment was made and exploration work was done in grading of white pine nursery stock. Two areas were established for statistically efficient testing of planting stock with respect to establishment methods, species adaptation, or any special treatments or classifications, under various site conditions. Work was started on the development of a method of rating the plantability of reforestation sites.

7. Plans for next year: No new studies will be initiated. Routine observations of established plantings will be made, schedule plantings of hardwoods will be made in conifer-hardwood experiments. Results of completed studies will be published.

8. Date of completion: Indefinite.

9. Assignment: L. H. Reineke.

RS-NE
FIRE
Control
(Pf-1)

February 1, 1940

FOREST FIRE CONTROL

1. Field Division: Forest Management.

2. Work Project: Forest Fire Protection.

3. Line Project: Forest Fire Control.

4. Purpose: To assist administrative organizations in the fields of forest fire prevention, pre-suppression, and suppression by analyses of forest fire records and forest fire detection systems, by studies of rate of spread of fire and by testing the efficiency of new materials and equipment under actual burning conditions.

5. Review of past work: Analyses have been made of fire records of Vermont (1911-1926), Maine (1916-1925), New Hampshire (1921-1925), and Connecticut (1921-1925), and the results of these studies were turned over to the respective state forestry departments for administrative use and publication. Experiments were completed with calcium chloride and Zenith Fire Dust on grass fires, but neither material proved effective in retarding or extinguishing fires. Studies of the lookout detection system on the White Mountain National Forest and of the entire states of Rhode Island and Vermont were conducted in 1936 and 1937. Reports on these analyses have been submitted to the respective administration agencies and form the basis for replanning forest-fire detection on the White Mountain National Forest and in Rhode Island and Vermont.

6. Accomplishments during past year: The hurricane of 1938 destroyed a considerable number of lookout towers in Massachusetts. Preliminary to the replacement of these structures, plans for a study of the detection system in that State were drawn up late in 1939 by the New England Forest Emergency Project with the assistance of the Station. The Station will continue to cooperate in a technical capacity while the study is being made.

7. Plans for next year: To render when requested technical assistance to the New England Forest Emergency Project in making the lookout detection study in Massachusetts.

8. Date of Completion: May 1940.

9. Assignment: P. W. Stickel.

RS-NE
FIRE
Behavior
(Pf-2)

February 1, 1940

FOREST FIRE BEHAVIOR

1. Field Division: Forest Management.

2. Work Project: Forest Fire Protection.

3. Line Project: Forest-fire behavior.

4. Purpose: To study weather and fuel moisture in relation to forest fuel inflammability in order to determine the various classes of forest fire danger that are the result of different types of forest-fire weather.

5. Review of past work: The results obtained from fire-weather studies conducted from 1926 to 1930 have been published as separate papers. The weather-fuel inflammability data have shown that duff moisture content is a reliable index to forest fire danger and that it can be estimated from integrated measurements of selected weather factors. Alinement charts for this purpose have been prepared for our important cover types in the Northeast. The material forming the basis of the previously issued alinement charts has been used in the preparation of individual fire-danger meters for the white pine, spruce-fir, and mixed northern hardwood type in the Northeast and for the general eastern fire-danger meter used by the special forest-fire weather service throughout the region.

6. Accomplishments during past year: The Station assisted the New England Forest Emergency Project and the U. S. Weather Bureau in planning the enlarged forest-fire weather service in the New England States, and in establishing the forest-fire danger stations on Long Island. Fire-danger stations are maintained at all the experimental forests of the Station in the New England States and daily reports are sent to the Boston office of the Weather Bureau.

7. Plans for next year: The Station, when called upon, will continue to cooperate with the New England Forest Emergency Project and the U. S. Weather Bureau.

8. Date of completion: Indefinite.

9. Assignment: P. W. Stickel.

RS-NE
FIRE
Effects
(Pf-3)

February 1, 1940

FOREST FIRE EFFECTS

1. Field Division: Forest Management.

2. Work Project: Forest Fire Protection.

3. Line Project: Forest Fire Effects.

4. Purpose: To study the effect of forest fires upon standing timber, reproduction, and site as a basis for standardizing methods of appraising fire damage, and to furnish basic information pertinent to the reforestation and management of burned areas.

5. Review of past work: The effect of basal wounding by fire which is being studied on a series of plots mostly in the oak region has indicated that this class of injury is responsible for considerable delayed mortality and subsequent attack by decay-causing organisms. For the purpose of securing basic data for standard regional fire damage appraisal tables for the oak region, information has been secured from 425 temporary plots that were located in 24 fresh burns in Connecticut and New York. In order to give an insight into the differences in heat resistance between different trees, a laboratory study of the bark of six common northeastern species is under way. The evidence to date indicates that heat resistance of trees is associated with certain morphological and anatomical characteristics.

6. Accomplishments during past year: The report on the study of standard regional fire damage appraisal tables for the Northeastern oak region was completed and distributed to state forestry agencies. While the data secured are too scanty to permit their use for regional tables, the study has disclosed the fact that for the oak region the actual average damage from fire appears to be from 1.5 to 4 times greater than the estimates submitted by fire wardens. A five-year progress report on the basal wounding investigation has also been completed. In general it appears that on light burns in the oak region less than 30 per cent of the surviving injured trees show no after effects of scorching. Delayed mortality that reaches its peak the second year following burning was found to average 31 per cent, while decay following burning amounted to 24 per cent, culminating the third year after the trees were scorched. The remaining 17 per cent of the injured trees were either insect infested, attacked by both insects and fungi, or had open fire scars.

7. Plans for next year: No further work is contemplated on the basal wounding study. Unless additional funds are forthcoming it will be impossible to do anything further on developing standard regional tables of fire damage values. All efforts will be concentrated on the bark study in order to complete the remaining laboratory and field work by July 1, 1940.

8. Date of completion: July 1, 1940.

9. Assignment: P. W. Stickel.

February 1, 1940

FIELD TESTS--NEW HYBRIDS

1. Field Division: Forest Management.

2. Work Project: Forest Genetics.

3. Line Project: Field tests--Oxford hybrid poplars.

4. Purpose: To determine adaptability of the Oxford hybrid poplars throughout the United States.

5. Review of past work: Cuttings of fifty-eight selected hybrid clones (produced by the breeding project of the Oxford Paper Company) were distributed to twenty-five cooperating Forest Service, Soil Conservation Service, Bureau of Plant Industry, and State nurseries throughout the United States. These cuttings were used in nursery tests to determine the adaptability of the individual hybrids in each region. The data furnished by cooperators are sufficient for practical evaluation of the individual clones.

6. Accomplishments during past year: During the past year additional clones were sent to cooperators requesting such material, and data forms were set up and sent to each cooperator for information on the growth and development of these hybrids during 1939. Many cooperators were able to test the most promising hybrid clones in field plantings, and others distributed such stock to planting agencies for field tests.

7. Plans for next year: Work during the coming year will be limited to filling requests for additional cuttings from cooperators, and analysis of the data on both nursery and field trials.

8. Date of completion: Final conclusions will be based on data from 10- to 15-year old plantations.

9. Assignment: E. J. Schreiner.

February 1, 1940

BREEDING AND INHERITANCE--FOREST TREES

1. Field Division: Forest Management.

2. Work Project: Forest Genetics.

3. Line Project: Breeding.

4. Purpose: Controlled breeding for the production of improved forest trees and for information on inheritance in forest-tree species.

5. Review of past work: A total of 1,110 seedling resulting from controlled pollinations previous to 1939 in Acer, Betula, Liriodendran, Magnolia, Ostrya, Quercus and Ulmus are now growing in the nursery. Controlled breeding with Hicoria, Carpinus, Cornus, Fagus, Pinus, and Tilia produced non-germinable seed, or seedlings which failed to survive. Studies on blooming habit indicate the presence of dichogamy in many forest species; failure of artificial self-pollination indicates probable self-incompatibilities in others.

6. Accomplishments during past year: The following seed, matured to controlled pollination, was collected in 1939.

	Kind of Pollination and No. of Seeds Produced			
Genus	Selfed	Intra-specific	Inter-specific	Totals
Betula	25,350	24,885	120,820	171,055
Fraxinus	Not made	900	1,440	2,340
Pinus	174	2,072	1,693	3,939
Quercus	Not made	6	8	14
Tilia	77	13	114	204
TOTALS	25,601	27,876	124,075	177,552

Fruit failed to set to controlled breeding with Acer, Ostrya and Magnolia.

7. Plans for next year: Breeding work will be continued with the genera listed above.

8. Date of completion: Controlled breeding will be continued every year.

9. Assignment: E. J. Schreiner, A. G. Snow, Jr., J. W. Duffield.

INDIVIDUAL VARIATION

1. Field Division: Forest Management.

2. Work Project: Forest Genetics.

3. Line Project: Variation in percent sugar in the sap of sugar maple.

4. Purpose: To investigate the extent of inherent variation of percent sugar and to discover trees in which percent sugar is consistently high.

5. Review of past work: The status sheet for this work for 1938 was headed "Inheritance of Sugar Content in the Sap of the Sugar Maple." Early work indicated that individual trees might show inherent differences. The method for determining the percent sugar was rather crude, and it was apparent that a more refined technique was needed.

6. Accomplishments during past year: During the past year trees which had been tested during 1937 and 1938 were again tested for percent sugar in the sap. Sugar determinations were made with an accurate field saccharimeter. The individual trees tested in 1939 produced from 1 percent to slightly over 4 percent sugar; the percent sugar in the sap of individual trees has been quite consistent from year to year.

7. Plans for next year: The same trees which have been used for the past three years will be tested in the spring of 1940, and the existing data will be analyzed to determine the possible effect of environment on percent sugar in the sap.

8. Date of completion: Preliminary selection for inherent variation in sugar content should be possible in 1941; final conclusions will be based either on progeny tests or on tests of selected clones grown on different sites.

9. Assignment: E. J. Schreiner, A. G. Snow, Jr., J. W. Duffield.

February 1, 1940

RACIAL VARIATION

1. Field Division: Forest Management.

2. Work Project: Forest Genetics.

3. Line Project: Seed source investigations.

4. Purpose: To evaluate strains or varieties of native and exotic species on the basis of their forest and use possibilities in the Northeastern region.

5. Review of past work: The status sheet for this work for 1938 was headed "Seed Source Investigations." In 1938 seed of red and white pine from Eagle Lake, Ontario, was purchased by the station and distributed to State nurseries at Saratoga, N. Y., Amherst, Mass., and Gerrish, N. H., for planting in the spring of 1939.

6. Accomplishments during past year: The seedlings of white and red pine of Canadian origin have to date exhibited no outstanding racial characteristics in growth and development. An unsuccessful attempt was made to obtain seed of white pine from the southern extremity of its commercial range for tests in the cooperating nurseries.

7. Plans for next year: Observations will be continued on the stock now growing in the nurseries, and a comparable test will be started with white pine seed from western Maine. In addition, fourteen lots of Norway spruce seed of diverse origin will be planted in a replicated nursery experiment at the Hopkins Memorial Experiment Forest. This is part of the International Forest Tree Test.

8. Date of completion: 1941.

9. Assignment: E. J. Schreiner, T. F. Breon.

RS-NE
GENETICS
Cytology

February 1, 1940

CYTOLOGY--CHROMOSOME INVESTIGATIONS WITH FOREST TREES

1. Field Division: Forest Management.

2. Work Project: Forest Genetics.

3. Line Project: Chromosome Investigations.

4. Purpose: Determination of the chromosome number of trees used in breeding.

5. Review of past work: The status sheet for this work for 1938 was headed "Cytological Investigations." A series of problems on chromosome studies in forest-tree species was initiated in 1937. It was then necessary to suspend this work for two years.

6. Accomplishments during past year: The chromosome numbers in 19 species of oaks potentially useful for breeding was determined to be 24 in somatic tissue (haploid number, 12). An exploratory study on the natural occurrence of polyploid races of red maple, based on stomata counts from herbarium specimens, indicated that in the Canadian life zone there may be found races of Acer rubrum with higher chromosome numbers than those found in races with a more southern distribution.

7. Plans for next year: The findings with regard to natural polyploidy in A. rubrum will be checked by root tip counts from seedlings obtained from the southern and northern limits of the natural range of the species. Chromosome number investigations will be continued with special emphasis on trees used in breeding operations. Chromosome number investigations of the first-generation Oxford hybrid poplars will be started to aid in planning second-generation crosses.

8. Date of completion: The preliminary study on natural polyploidy in red maple will probably be completed in 1940. Chromosome number investigations of parent trees used in breeding will be continued from year to year.

9. Assignment: J. W. Duffield.

RS-NE
GENETICS
Cytology

February 1, 1940

CYTOLOGY--REPRODUCTION IN FOREST TREES

1. Field Division: Forest Management.

2. Work Project: Forest Genetics.

3. Line Project: Pollen-tube penetration in forest trees.

4. Purpose: Studies of pollen-tube penetration in the pistils of tree flowers.

5. Review of past work: The status sheet for this work for 1938 was headed "Cytological Investigations." Exploratory work on pollen-tube penetration initiated in 1937 had to be suspended for three years.

6. Accomplishments during past year: Nothing could be done on this line project in 1939 because technical personnel was not available until after the blooming season.

7. Plans for next year: Exploratory work on pollen-tube penetration in species of Quercus, Hicoria, and Tilia will be undertaken to help explain failure to obtain seeds set to controlled pollination.

8. Date of completion: Pollen-tube penetration studies will be continued every year, as additional parent trees are used in controlled breeding.

9. Assignment: J. W. Duffield.

February 1, 1940

PHYSIOLOGY--VEGETATIVE PROPAGATION OF FOREST TREES

1. Field Division: Forest Management.

2. Work Project: Forest Genetics.

3. Line Project: Propagation by cuttings.

4. Purpose: To develop economically feasible methods for vegetative propagation of important forest-tree species.

5. Review of past work: Rooting of dormant cuttings of aspen hybrids was increased from less than 1 percent to 65 percent; greenwood cuttings of white birch were rooted 50 percent; red maple, 60 percent; and yellow birch, to a lesser extent, by treatment with indolebutyric acid. Early work was carried on in the greenhouse, but during 1938 cuttings were planted in outdoor sandbeds. In outdoor beds sugar maple cuttings rooted 80 percent; red maple, 70 percent; and basswood, 25 percent.

6. Accomplishments during past year: Results slightly better than in previous years were obtained with hardwood species treated with the growth-promoting substances and planted in outdoor sandbeds. Experimental work was started with white pine, which apparently roots very slowly. Examination at the end of the growing season of half the white pine cuttings indicated that increased rooting had not been obtained by any of the treatments. Since they were still living, the undisturbed cuttings were left in the bed for further growth next year. An experiment designed to test the variability of response to treatment with growth-promoting substances in red maple clones indicated that this is apparently an inherent characteristic. The average rooting of cuttings from different individual trees ranges from 18 percent to 98 percent.
(Reported in Technical Note No. 29.)

7. Plans for next year: The work will be directed toward further information on the inheritance of rooting response in red maple and to more extensive tests with dormant and greenwood cuttings of white pine.

8. Date of completion: To be continued until some other agency undertakes adequate work along these lines with species used in the Genetics project.

9. Assignment: A. G. Snow, Jr.

RS-NE
GENETICS
Physiology

February 1, 1940

PHYSIOLOGY--REPRODUCTION IN FOREST TREES

1. Field Division: Forest Management.

2. Work Project: Forest Genetics.

3. Line Project: Pollen storage and restoration of germinability.

4. Purpose: Development of adequate pollen storage methods and methods for restoration of germinability.

5. Review of past work: Work in previous years has been entirely of an exploratory nature and has merely indicated appropriate experimental methods.

6. Accomplishments during past year: The results so far obtainable from a storage experiment started in the summer of 1939 indicate that for white and red pine pollen storage conditions of 25 percent relative humidity and 4° C. are optimum. It was found that after storage at low humidities germinability of pollen may be restored by brief periods of humidification. White and red pine pollens were found to respond differently to the interaction of temperature and humidity, thus suggesting a fundamental difference in the physiology of the pollen of these two species.

7. Plans for next year: The work with white and red pine pollen will be continued. Exploratory work on storage methods for pollen of oak and maple species will be initiated.

8. Date of completion: Work with all genera used in breeding will probably require five to ten years.

9. Assignment: E. J. Schreiner, A. G. Snow, Jr., J. W. Duffield.

February 1, 1940

FUELWOOD UTILIZATION

1. Field Division: Forest products.

2. Work Project: Timber Harvesting and Conversion.

3. Line Project: Fuelwood Utilization.

4. Purpose: To determine possible uses for low grade hardwoods as a source of fuel to the end that waste of such material is minimized and a return may be expected on material removed in Silvicultural treatment.

5. Review of past work: Studies initiated in November 1939.

6. Accomplishments during past year: Working plans completed and cooperation of interested state agencies secured. Preliminary work of undertaking studies well underway. No results yet reportable.

7. Plans for next year: Continue studies on slow-combustion stoves, hogged wood, fuel wood production methods and equipment, production of charcoal and uses of producer gas.

8. Date of completion: Charwood heater observations, fuel wood production equipment and methods and hogged wood production by July 1, 1940. Amplification of these studies is desirable and should be made providing funds are made available.

9. Assignment: Allen W. Bratton.

RE-NE
FOREST SURVEY
Inventory

February 1, 1940

FOREST SURVEY

1. Field Division: Forest Survey.

2. Work Project: Survey of Forest Resources.

3. Line Project: Inventory: Cooperative technical supervision of an inventory of forest resources in south-western Maine.

4. Purpose: To insure adequacy of field methods in the CCC type map and inventory of the white pine region of southwestern Maine and to determine the most desirable technic for inventorying the entire Northeast.

5. Review of past work: In 1936 twelve enrollees and a foreman at each of four CCC camps in southwestern Maine began a type map and inventory of forest resources in accordance with plans for field and office work prepared by the Northeastern Station. Initial training of field crews was supervised by the Station. One CCC camp was discontinued in 1937, but the crews in the remaining three were doubled. Sixty-seven towns, about 1,340,000 acres, were covered by the 0.25 percent cruise in 1936, 1937, and 1938.

6. Accomplishments during past year: Because of the demands for insect control work, no crews were available for the survey and no work was done during this year.

7. Plans for next year: If type mapping is resumed, the inventory work will be reduced to the intensity which will be required for the region-wide survey. Data from past seasons will be organized for further use in the Regional Survey and for other uses. Report to be issued on results of survey to date.

8. Date of completion: Indefinite.

9. Assignment: L. H. Reineke

RE-NE
FINANCIAL ASPECTS
Private Forestry February 1, 1940

COOPERATIVE MANAGEMENT AND MARKETING FOR FARM WOODLANDS

1. Field Division: Forest Economics.

2. Work Project: Private Forestry.

3. Line Project: Cooperative management and marketing for farm woodlands.

4. Purpose: To establish the technical basis for cooperative management and utilization of farm woodlands in order to rebuild depleted growing stocks, restore and stabilize local forest industries, and afford woodland owners regular and more adequate income.

5. Review of past work: The Otsego Forest Products Cooperative Association was incorporated in December 1935. After a considerable period of delay operations were finally started. Membership has grown to about 350, with close to 250 woods operations. The operations of this Association have followed very closely the principles and methods arising out of work of the project staff. The activities of the Association include harvesting and marketing of timber, starting with the stump and ending with the consumer. Great variety and types of problems have been encountered dealing with land use, rural relief, forest management, log grading, timber processing, and accounting. Since the Association planned to have its own processing facilities, a plant specially adapted to the needs of local woodlands was designed and erected. Most of the research work necessary in connection with this program of activity was carried on by the project staff, and was done in addition to carrying on more generalized studies of the place of woodlands in rural economics.

6. Accomplishments during past year: A quick and cheap system of woodland inventory was perfected, and as a service activity to the Association the cutting control, including selection of trees to be removed, was carried out on the woodlands of Association members. Log grades were revised and preliminary study of timber quality was made. Time and cost data were taken on felling, log making, and skidding in hardwood stands under various degrees of cutting. Tractor and truck operation studies were made in connection with the logging and lumbering operations. New cutting areas under the Associations' program were surveyed for compliance with marking and observations made on condition. A simplified method of stump tallying

was devised. Economic data, covering relation of farm woodland activity to other farm activities were compiled, this being a continuation of work started the previous year. Studies of yard seasoning methods, together with recommendations for Association practice, were prepared. Studies of kiln drying green hardwood dimension were started. These involved such factors as drying degrade and uniformity. Considerable study was given to dimension stock equipment and layouts, and studies on the recovery of various items, particularly heavy squares, were made. Study of planing costs was carried on. The accounting system previously devised was thoroughly tested and revisions made which would give better cost data. Considerable study was given to organization of Associations' operations from a personnel standpoint. The project staff maintained intimate contact with all the business affairs of the Association, and acted throughout the year as technical advisers on many problems, including mill construction, adjustment and operation, training of personnel, and marketing of products. In addition the staff supervised the loans made to the Association by the FSA.

7. Plans for next year: Heretofore much of the activity has been concerned with putting the Association operations on a going basis. The plans for the coming year involve continuation of service and studies on all phases of operation. Considerable work must be done on grading of raw material and on the extension of operations in order to get greater recovery from low grade material. As a service to the Association, the staff will continue the application of necessary growing stock control measures. Studies of rural farm economics will be continued. Association activity in the processing and marketing fields will be followed very closely to obtain data on costs and recoveries on all types of materials. Study will be given to problems of management and personnel training, as well as to methods of carrying technical information back to members. There will be continued supervision of financial affairs. More time will be devoted to analysis of results obtained in studies heretofore in progress.

8. Date of completion: Indefinite.

9. Assignment: C. R. Lockard, M. B. Dickerman, D. E. Rulison, H. B. Price.

RE-NE
FINANCIAL ASPECTS
Private Forestry

February 1, 1940

1. Field Division: Forest Economics.

2. Work Project: Private Forestry.

3. Line Project: Marketing for Farm Woodlands.

4. Purpose: (a) To establish for a given economic unit the factors influencing returns from farm woodlands as a basis for future cooperative forest management in the unit.

(b) To develop methods necessary for carrying on similar studies elsewhere.

5. Review of past work: No direct work has been done on this project heretofore, although similar studies have been made in the northern hardwood region at Cooperstown, New York. This project is to be confined to the southernmost towns in Essex County, New York in the white pine region.

6. Accomplishments during past year: This is a cooperative project directed by the Northeastern Forest Experiment Station, in which the Federal Government, using Norris-Doxey funds, the New York State Experiment Station, and the New York State College of Forestry carry on work. A memorandum of understanding between the agencies has been prepared and personnel has been decided upon. The project funds are set up only for the fiscal year ending June 30.

7. Plans for next year: As soon as personnel can be obtained, detailed project plans will be developed. Due to the limitations of funds, work will be confined principally to a study of home use of wood on the farm. This will involve individual farmer interviews. Other economic information will be obtained and as much work as circumstances permit will be done on local markets for forest products. It is planned to prepare a report on home use of wood by June 30.

8. Date of completion: As indicated above, work on home use should be completed by June 30. If the project, however, should be of indefinite duration there should be at least a year's additional work in the white pine region.

9. Assignment: C. R. Lockard, R. D. Carpenter, J. M. Griswold.

RE-NE
FINANCIAL ASPECTS
Logging and Milling

February 1, 1940

SELECTIVE LOGGING

1. Field Division: Forest Products.

2. Work Project: Timber harvesting and conversion.

3. Line Project: Conversion: Logging and milling (a) northern white pine, (b) northern hardwoods, and (c) spruce and fir pulpwood.

4. Purpose: To study the effect of cutting practices on operating costs and profits, with especial reference to size of timber, and ultimate silvicultural conditions.

5. Review of past work: Pine and hardwood phases initiated 1934 and 1935 in cooperation with the Forest Products Laboratory. Pulpwood study undertaken in 1935. All three phases brought out economy in handling trees of larger size classes. Spread between operating costs and sale values more pronounced in lumber operations than for pulpwood. No variation in value of pulpwood product with size, but in lumber operations differences in cost augmented by increased values for better grades produced from larger trees. Comparative costs obtained on representative operations indicated that, except in the case of the smaller spruce and fir, partial cuttings added little or nothing to the handling charges for trees of a given size as compared with clear-cutting operations. Report on "The Costs of Producing White Pine Timber in New England" accepted for publication as a U.S.D.A. circular. Work on pine and hardwood log grades, provided basis for log grades adopted by New England Timber Salvage Administration.

6. Accomplishments during past year: Study areas established in connection with white pine logging and milling study remeasured. Original objectives altered in two localities and one area discontinued due to hurricane damage. These sample plots will be taken over as part of the white pine management project. Logging plots in hardwood and spruce-fir stands were transferred to northern hardwood and spruce management projects respectively. One series of hardwood plots was wrecked by the hurricane and abandoned. A Technical Note brought out the relative merits of edging white pine. The pine study also provided the basis for an article "Harvesting Second-Growth White Pine" that appeared in the August issue of the Eastern States Cooperator.

7. Plans for next year: Pulpwood report to be issued as Station Occassional Paper.

8. Date of completion: 1940.

9. Assignment: Victor S. Jensen.

February 1, 1940

PRELIMINARY FLOOD CONTROL EXAMINATIONS

1. Field Division: Forest Influences.

2. Work Project: Flood Control Surveys.

3. Line Project: Preliminary Examinations.

4. Purpose: In cooperation with the Soil Conservation Service and the Bureau of Agricultural Economics, to make preliminary examinations of New York and New England watersheds enumerated in the Omnibus Flood Control Act of 1936 and subsequent amendments thereto (1937,1938) for the purpose of determining whether a detailed survey to develop a specific flood control program from the standpoint of runoff, waterflow retardation, and soil erosion is justified.

5. Review of past work: A negative report on the Blackstone River was submitted in 1938.

6. Accomplishments during past year: Completion of reports for the Upper Susquehanna and Connecticut Rivers both of which were positive. Material for preliminary reports on the Wallkill and Mohawk Rivers was gathered.

7. Plans for next year: Uncertain because of pending reorganization of Flood Control set-up.

8. Date of completion: Uncertain.

9. Assignment: Earl J. Rogers.

February 1, 1940

FLOOD CONTROL SURVEYS

1. Field Division: Forest Influences.

2. Work Project: Flood Control Surveys.

3. Line Project: Watershed Surveys.

4. Purpose: Detailed surveys in cooperation with the Soil Conservation Service and Bureau of Agricultural Economics, of watersheds approved by the Secretary of Agriculture under the Omnibus Flood Control Act of 1936 as amended, to develop specific economically justified programs of headwaters flood control from the standpoint of land management retardation of runoff and soil erosion prevention.

5. Review of past work: The surveys of the Upper Susquehanna River and Buffalo Creek under the chairmanship of the Soil Conservation Service have been completed to the extent of 12 and 96 percents respectively. The surveys of the Merrimack and Connecticut Rivers under the chairmanship of the Forest Service have reached 98% and 5% completion respectively.

6. Accomplishments during past year: All of the work listed in the preceding paragraph represents the accomplishments of the past year except for 85% of the progress on Buffalo Creek and 45% of the progress on the Merrimack which were made in 1938.

7. Plans for next year: It is planned to complete the reports on Buffalo Creek and the Merrimack River. Completion of Buffalo Creek report has been held up pending analysis of hydrology in cooperation with Washington Office and submission of final damage data by Army Engineers. The surveys on the Connecticut River and on the Upper Susquehanna will be continued.

8. Date of Completion:

Merrimack River	-	Spring, 1940.
Buffalo Creek	-	Spring, 1940.
Connecticut River	-	January 1942.

9. Assignment:

Working Committee Member	-	Wm. Mollenhauer, Jr.
Regional Hydrologist	-	Clarence N. Morang
Connecticut Survey	-	Walter K. Starr
Upper Susquehanna Survey	-	Charles H. Diebold

February 1, 1940

STREAMFLOW ON FORESTED WATERSHEDS

1. Field Division: Forest Influences.

2. Work Project: Influence of natural vegetation on streamflow.

3. Line Project: Relation of forest and herbaceous cover to streamflow.

4. Purpose: To study the streamflow on small forested watersheds and the effect of changes in vegetative cover and land use practices.

5. Review of past work: A weir and stream-gauging station with two ground-water measuring wells have been in operation at the Chenango Experimental Forest since 1938. Since that same year, two out of a series of five stream-gauging stations have been in operation at the Hopkins Memorial Experimental Forest.

6. Accomplishments during past year: Four additional ground-water measuring wells were added to the field installation at the Chenango Experimental Forest. In addition, a silting basin was constructed above the weir and discharge measurements were made during low water stages for the purpose of obtaining rating data. At the Hopkins Memorial Experimental Forest two of the three remaining weirs were completed and log barriers, silting basins, and footbridges were constructed at all the weirs.

7. Plans for next year: Four additional ground-water measuring wells will be constructed at the Chenango Experimental Forest and the remaining weir at the Hopkins Memorial Experimental Forest will be completed. The stream flow measurements will be continued at all gauging stations and if funds are available the various weirs will be rated.

8. Date of completion: Indefinite.

9. Assignment: P. W. Stickel.